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Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

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Electrical Industrial Developments.

IT is not at all unnatural, after all the rumours that have been current and the transatlantic Press hubbub in the form of telegraphic dispatches appearing in the London newspapers, followed by qualifications and contradictions, that the annual meetings of some of our electrical manufacturing companies should have been awaited with more than usual interest. Rumours we need not dwell upon extensively, for "rumour is a lying jade," however interesting her attire or lack of it, and however fascinating she may be to the daily newspapers; but she sometimes affects markets and causes disquiet amongst the staff *personnel* and even the workpeople of an industry.

Some of the speeches delivered at the meetings of concerns named in the Press and in the rumours, have already been reported in our pages, and this week others are given. From these, it may be, readers will be able to gain information which may clarify the situation, but of course, even when addressing their shareholders, directors are not likely to pass beyond actual facts and dwell upon future possibilities and intentions for the mere gratification of curiosity.

After all that has been written officially and otherwise during the last year or two regarding the lines along which successful industrial reorganisation would travel in the near future, closer relations between various electrical companies must have been viewed as a foregone conclusion, the chief speculation being concerned with the exact businesses likely to act unitedly and with the classes of product likely to be affected. Nobody with even a moderately accurate knowledge of the ramifications of the electrical industry will pay much attention to the Press dispatch reporting that Mr. Dudley Docker's recent activities in connection with certain famous companies represent a design or even a desire on his part to "unite the British electrical industry into a single powerful unit"; and when such extravagant statements are made as that the "Thomson-Houston Company, a British subsidiary of the General Electric Co., intends to participate extensively in a

movement sponsored by the Government for the establishment of a national electrical system in England," one merely credits the British Thomson-Houston Co. and the Metropolitan-Vickers Co. with hoping through their new and closer relations and their interest in certain other companies, to secure larger and more profitable business as electrical development proceeds under the supervision of the Central Electricity Board.

In this connection we may direct attention here to the statement made by Mr. H. C. Levis, the chairman of the British Thomson-Houston Co., Ltd,, last week, and suggest that it be taken in conjunction with that delivered by Sir Philip Nash at the Metropolitan-Vickers meeting held on March 16th (ELEC. REV., March 23rd, p. 519). Mr. Levis, after covering routine matters, said that though the general industrial position of his company had improved during 1927; though the effects of the coal strike of 1926 were no longer seriously felt; and though the output from the factories had been considerably greater than for the previous year, the percentage of profit had been lower, with the result that, while the total profits were above those for 1926, they were not adequate, nor were they commensurate with the increased output. This had induced the company to make arrangements with the Metropolitan-Vickers Co.—negotiations are reported to be far advanced—for closer co-operation which would lead to eliminating unnecessary duplication of effort and expenditure and to effecting economies in various directions, such as research engineering development, manufacturing processes, and the purchase of materials. Similar arrangements had been made with the Edison Swan Electric Co. and Messrs. Ferguson, Pailin—both of which compacts were already fairly well known—but Mr. Levis added that the activities of none of these companies were to be curtailed. The elimination of unnecessary waste—a measure which no busine s men will condemn—is the objective which, it is stated, is to bring benefit to all parties.

It is hoped that by keeping B.T.-H. plants up to date and co-operating with others, a constant improvement in methods of manufacture will ensue. The extreme competition in various sections of the industry at home, and the competition from foreign traders too, prevent, as Mr. Levis said, the future being looked forward to with that greater confidence which should be engendered by the knowledge that the demand for electrical apparatus and appliances is increasing and cannot fail to continue to do so. With great activity before us, we ought to be prepared with measures which will ensure that the advantage is not vitiated by reckless competition. So far as the question of foreign capital enters into this part of our present electrical situation, it has long been common knowledge here that the American concern with which the B.T.-H. has always been identified has been a large holder of ordinary shares. The chairman remarked that what the company was doing was to build up an undertaking so that it would be one of the foremost British manufacturing enterprises, and the ordinary capital used in this effort —the portion on which the return was uncertain—was held by the International General E'ectric Co. The capital which is reasonably certain of its return is held here. After all, what is so important is the wages bill which an electrical manufacturing company is able to pay to British workpeople. Our unemployment roll deeply distresses most people who are interested in the nation's future well-being, and any effort should be welcomed which will enable more wages to be earned. Any co-operative arrangements which will prevent orders from being executed abroad, and will add to the number of men and women employed in these islands whether these co-operative arrangements be of the B.E.A.M.A. class or by several companies acting together on their own, should assist toward industrial recovery unless other factors, at present unforeseen, ultimately arise to operate adversely.

It is possible that as the year goes on there will be other developments; for the present the measures now announced will be operating, and in course of time will be justified or otherwise by results. At the moment we feel that those who have expressed their views concerning an ultimate disastrous effect of mutual arrangements upon the industry should not be over-anxious. We have in our midst examples of amalgamations which have proved successful, and others which have not so proved because they were born at an awkward period. But we must always remember that the British electrical industry has a long, long way to go before it can reach the peak of its consumption of electrical products, and there should be room for every efficiently financed, controlled, and managed concern. It need not happen that smaller concerns will go to the wall, nor need it mean the breakdown of co-operation between them. It is possible, as we suggested in a recent leaderette, that the organisation that has represented the majority of the industry may have to undergo changes to adapt itself to a changing situation, but the industry should endeavour to march forward as a body without unduly hampering individual initiative. The new situation does not seem to us likely to contradict the experience of the past, both here and in the States, that whatever happens there is always plenty of room for small businesses to be established and developed and for men of real ability and enterprise to find free play for the exercise of these qualities.

We have entered upon the period of very big things electrically, and big concerns are needed to handle them, but side by side with these businesses, as in America and in Germany, there will still be plenty of opportunity for others without their having to be content with only the crumbs that fall from the rich man's table.

Overhead Lines and Wayleaves.

ELSEWHERE in this issue Mr. W. T. Taylor reviews the new Overhead Line Regulations from the point of view of the designer, appraising the value of the changes in loading, &c., which have been made; in his opinion, whilst they are helpful, they fall far short of the ideal, and present a number of loopholes for criticism.

No doubt these and other points will receive due attention, and we shall hope to see the Regulations further relaxed wherever that is possible. But Regulations alone by no means constitute the whole of the obstacles opposed to rural electrification; the question of wayleaves is of equal importance, whilst it is more difficult to deal with owing to the existence of vested interests.

Much light was thrown on this subject at the last meeting of the Overhead Lines Association, when the standardisation of wayleave forms was under discussion (ELEC. REV., April 27th, 1928, p. 755). The first essential of a form to be signed by a landowner or tenant is that it shall be as simple as possible and shall contain no provisos or reservations at which the layman may take alarm; legal terms should be avoided, lest professional advice be invoked to interpret them, with fees to follow. The other factor of prime importance in wayleave negotiation is that of rent for poles, &c.; although in most cases reasonable terms can be arranged, there are many exceptions where the owner or tenant forms an exaggerated estimate of the interference with user or depreciation of amenities of his property, due to the presence of poles and lines, without regard to the probable appreciation of its value due to the availability of electricity. The Electricity Commissioners have already rendered valuable assistance in this respect, their Memorandum on Electrical Development in Rural Areas of August, 1927, being altogether admirable in spirit and in substance; as we said when that Memorandum was issued, we hope they will go further and help to inculcate in the countryman a realisation of the benefits that he and his neighbours stand to gain from the extension of electricity supply to their thresholds. Copies of that Memorandum can be obtained from the Commissioners free of charge, and should be widely circulated.

Railway Electrification in India.

Some details of the B.T.H. electrical equipment of the new Cammell Laird rolling stock for the Bombay, Baroda and Central India Railway Co.'s suburban lines, and of the "Metrovick" locomotives for the Great Indian Peninsula Railway.

WITH the official inauguration of electric traction on its Bombay suburban section this year, certain aspects of which conversion have already been dealt with*, the Bombay, Baroda and Central India Railway Co. entered upon a new era in its history.

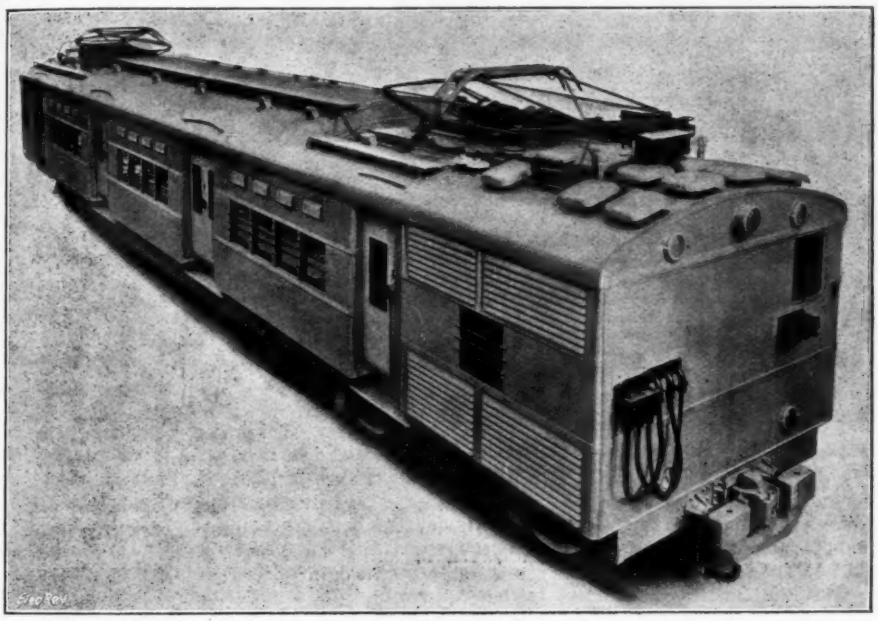


Fig. 1.—Motor Coach for Bombay, Baroda and Central India Railway.

It will be recalled that the railway sub-stations feed the track overhead contact lines with direct current at 1,500 volts, the running rails forming the return circuit. The rolling stock consists of 160 steel coaches, 40 of them being motor coaches with one driving end (fig. 1), 80 trailer coaches with one driving end, and 40 ordinary trailer coaches. They were built by Messrs. Cammell, Laird & Co., Ltd. Each motor coach is provided with four motors, two on each bogie (fig. 2), permanently connected in series, and control is effected on the electro-pneumatic multiple-unit system arranged for automatic acceleration.

B.T.-H. Equipment for Bombay Railway.

Made up on the unit system, a train consists of four coaches in the following order: driving trailer coach, trailer coach, motor coach and driving trailer coach. The control equipments are capable of operating three four-coach units, namely, a twelve-coach train having seating accommodation for about 1,500 passengers, the capacity of the existing steam trains being about half this amount. As the equipment is capable of accelerating a fully-loaded train at the rate of approximately one mile per hour per second, it is possible to attain a speed of 27 m.p.h. in half a minute from starting. The complete electrical equipment of the coaches was supplied by the British Thomson-Houston Co., Ltd.

The driving motors are of the ventilated commutating-pole railway type insulated for 1,500 volts and rated on the one-hour basis at 275 h.p. at 720 r.p.m., 700 volts. As the track is frequently flooded during the monsoon season to a depth of 2 ft., the motors have been designed so that they can be made watertight by fitting solid covers over the inlets and outlets of the ventilating ducts. A master controller is fited in each driving compartment (fig. 3) on both the motor and driving trailer coaches, and controls through a system of train wires the electro-pneumatic camshaft main controllers (figs. 5 and 6) installed on each motor coach; thus control of all the driving motors on a train is obtained from any motor coach or driving trailer coach.

On each motor coach a supply of compressed air for operating the main controller, pantograph collectors, sanders, and whistles is obtained from a 1,500-volt motor-driven compressor fitted with an automatic governor.

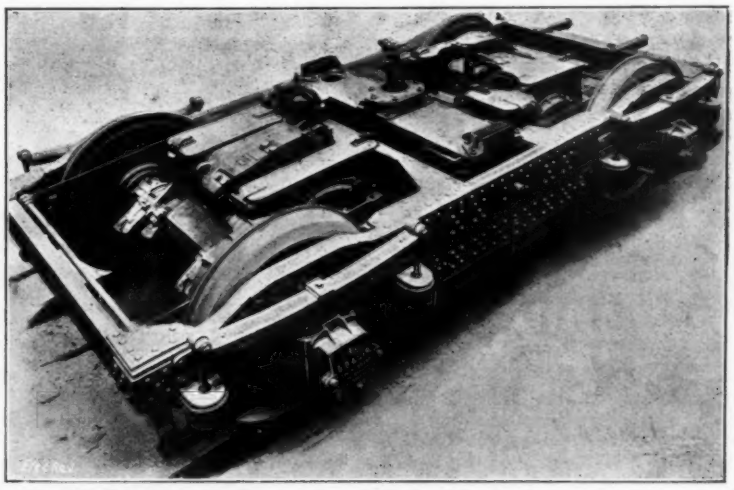


Fig. 2.—Bogie for Motor Coach, showing the two 275-h.p. Motors.

The vacuum exhauster for the brakes is operated by a 1,500-volt series-wound two-speed motor; when the handle of the vacuum-exhauster controller is on any of the running points, except the "release" point, the motor runs at the lower speed, but when the controller

* See ELEC. REV., Feb. 13th, 1925, and Feb. 3rd, 1928.

handle is on the first running point (release) the motor field is tapped and the motor runs at nearly twice the normal speed. An 8-kW motor-generator on each motor coach has its motor connected to the 1,500-volt circuit and its generator energises all the control, lighting, and other auxiliary circuits at 110 volts, which is not subject to such violent fluctuations as is the line voltage, this result being achieved without the use of any external regulator, as a special arrangement of the magnetic circuits and windings is employed.

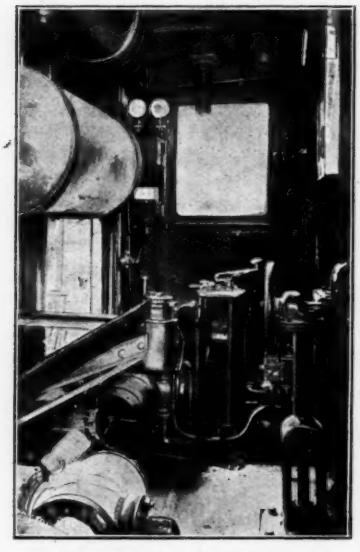


Fig. 3.—Interior of Driving Cab of Motor Coach.

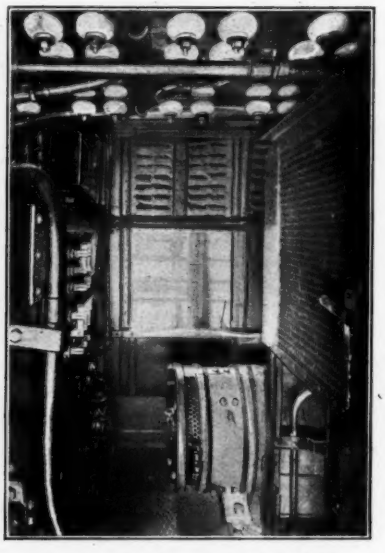
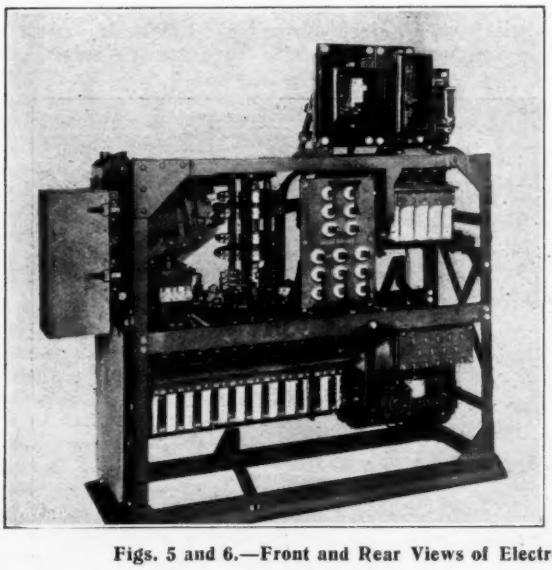


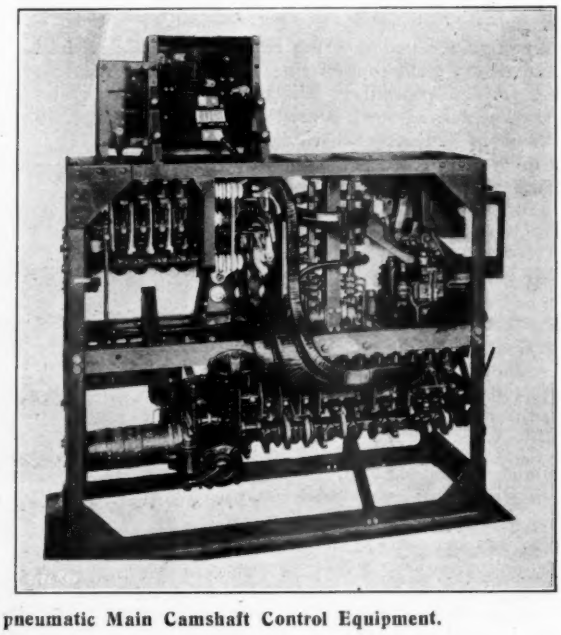
Fig. 4.—Interior of Motor Coach, showing High-voltage Chamber.

A camshaft control equipment (figs. 5 and 6) consists of a frame containing the cam-operated contactors, with their electrically-operated air engine, for performing the switching operations to start the main motors; a field tapper, with its air engine, to tap the main motor fields so as to give higher speeds under the control of a field tap relay; an air-operated, electrically-controlled, reverser for determining the direction of motion of the train; a line breaker, taking the form of two air-operated electrically-controlled contactor units connected in series and arranged to trip under the control of a separate latched overload relay; a special current-limiting relay to provide automatic acceleration of the cam-operated contactors, depending on the load; and a potential relay to interrupt the control circuits in case of the failure of the supply, thus preventing the motors being thrown direct on the line.

The main motor contactors, line circuit breakers, reverser, and field tapper are operated by air pressure and controlled by electromagnetically-operated air valves. The contacts of the two line breakers are connected in series on the high-voltage side of the equipment to rupture the main current when the master controller is moved to the "off" position; they are opened by a separate overload relay in the event of an overload, or short circuit, occurring. There are six power points on the master controller, the first being the "shunting" position, in which only the line breakers close, all the main resistances being in series with the motors; the other points are "full series," "series by-pass," "parallel by-pass," "full parallel," and "tap field."

The reverse cylinder of the master controller is set by means of a removable driver's key in either the forward or reverse position; all train wires are de-energised before the key can be removed, and the controller cannot be operated without the reverser handle. A "dead man's" switch operated by the handle of the main controller must be depressed before the reverse key is moved from the "off" position, so preventing operation of the pilot valve for emergency brake application; further, the controller is provided with an auxiliary contact device (carrying the control currents), which is brought into operation only when the handle is depressed, then making contact when the controller is moved to the first power point. If the handle is released when on any other point, this device will interrupt the control current for the contactors, and the emergency brake pilot valve will operate; the pilot valve, however, will also operate in the "off" position when the main handle is released, unless the reverse key is in the "off" position.





Figs. 5 and 6.—Front and Rear Views of Electro-pneumatic Main Camshaft Control Equipment.

The automatic acceleration takes place when the main controller is moved to the "running" position desired, but provision is also made for non-automatic acceleration: thus, by moving the controller momentarily to the "full series" point, acceleration can be achieved at a

notching current below that for which the current-limiting relay is set. Again, in such a case as starting from rest on a heavy gradient it is possible to advance a notch on the control equipment, even though the current-limiting relay is held due to the main current flowing through the coil being in excess of that for which the relay is set. To enable this to be done, two "by-pass" points have been provided on the controller, so that by moving the controller from the "full series" point to the first "by-pass" point and back again, or backwards from the "full parallel" point to the second "by-pass" point and forward again, the equipment can be accelerated at will by bringing into operation an auxiliary armature forming part of the current-limiting relay. This causes the main camshaft controller air engine to advance the controller a notch, although the main current-limiting relay armature is held owing to the high value of the motor current through its series coil.

In order to move the controller handle from the "full parallel" point to the "tap field" point, it is necessary to release a mechanical interlock on the cap plate. The field tapper itself consists of four contactor elements operated by a camshaft, the construction and method of operation of this part of the equipment being similar to that of the main camshaft and contactors.

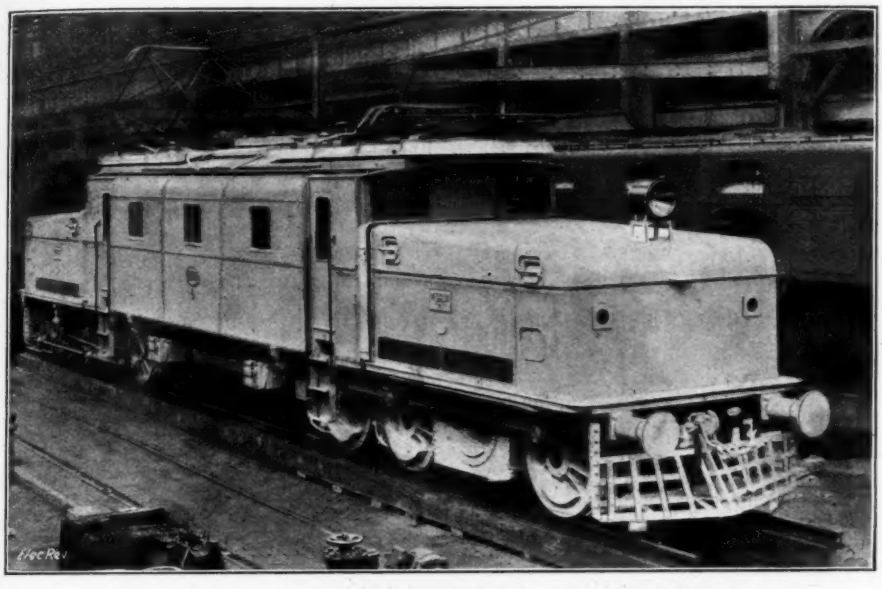


Fig. 7.—Freight Locomotive, 2,600-h.p., for the G.I.P. Railway.

"Metrovick" Locomotives for G.I.P. Railway.

The two locomotives illustrated in figs. 7 and 8 are of exceptional interest in that they are indicative of important recent developments in electric locomotive construction in this country. They are to be used respectively for freight and passenger services on the main lines of the Great Indian Peninsula Railway, from Bombay to Igatpuri and Poona, and have been erected and equipped by the Metropolitan-Vickers Electrical Co., Ltd., to the specification of Messrs. Merz & McLellan, the consulting engineers for the scheme.

The freight locomotive (fig. 7) is said to be the largest and most powerful yet built in this country and is the first of 41 similar locomotives which are being supplied by the company, each equipped with motors totalling 2,600 h.p. and weighing over 120 tons, the whole of which is adhesive weight. They are articulated, with a body about 60 ft. in length, carried on two trucks which are coupled by a flexible joint; the rigid wheel base is thus reduced to that of a single truck, *viz.*, about 16 ft., which enables sharp curves to be negotiated. Regenerative braking is provided to enable heavy trains to be safely handled on the heavy gradients. They will operate at 1,500 volts, collected from an overhead line, and the control is electro-pneumatic.

The mechanical parts of the first ten locomotives are being constructed by the Swiss locomotive works at Winterthur, and those for the remaining 31 by the Vulcan Foundry Co.

The passenger locomotive (fig. 8) presents many interesting features: it has three driving axles, one four-wheel bogie truck, and one two-wheel pony axle working in conjunction with the nearest driving axle so as to form virtually a four-wheel truck. The electrical equipment includes six 360-h.p motors and electro-pneumatic control. The mechanical parts have been supplied by the Swiss locomotive works. This locomotive is mechanically safe for speeds up to 85 miles per hour; for speeds of this magnitude it is necessary that as little dead weight as possible should be carried on the axles, and the motors and their gearing have accordingly been rigidly mounted on the frame of the locomotive, and transmit their power to the driving axles through a universal-motion flexible-link drive which is capable of accommodating the route of movement between axles and frame; all the weight is thus spring-borne and the centre of gravity is comparatively high. Average gradients of 1 in 40 are encountered over long distances; on them a passenger train will be assisted by a freight locomotive operating as a banking engine.

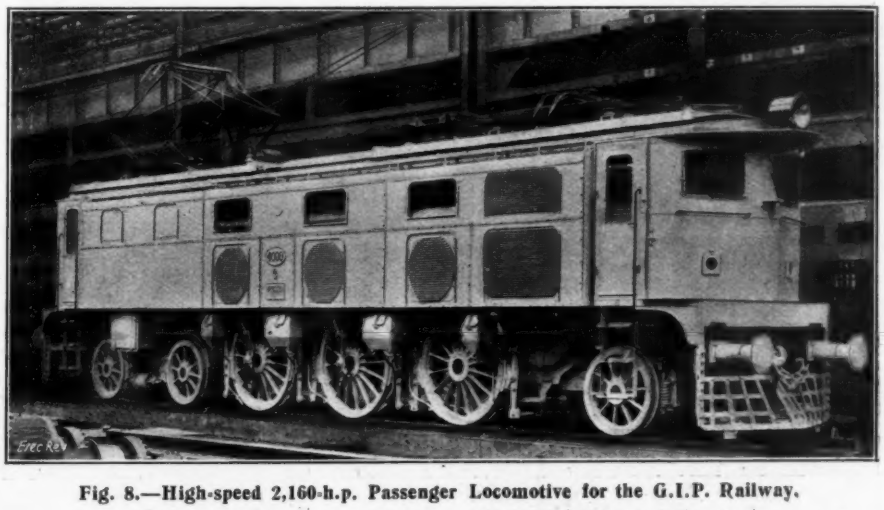


Fig. 8.—High-speed 2,160-h.p. Passenger Locomotive for the G.I.P. Railway.

Carliol House.

An illustrated description of the new headquarters of the Newcastle-upon-Tyne Electric Supply Company and associated companies.

A FEW months ago we published an illustration of Carliol House, Newcastle, the new premises of the Newcastle-upon-Tyne Electric Supply Co., Ltd. We are now able to present a description of this beautiful building, which was formally opened in December last.

The name is that of an old tower in the city wall, which once stood near the site, and of a family which was intimately concerned with the city's affairs six or seven hundred years ago. The tower has long since made way before the march of progress, but in Carliol House it has a worthy successor.

Fig. 1.—Carliol House.

The main body of the building has eight floors, but over part of it there is an additional storey. To convey an idea of the imposing appearance of the building, we reproduce a view of the exterior (fig. 1), and to illustrate some of the architectural detail, one of the main staff entrance (fig. 2). The building rises to a height of about 100 ft., and the dome surmounting the corner of the building adds another 17 ft., while its diameter is 35 ft. In the top of the dome is a glass panel 6 ft. in diameter, through which a beam or sky sign can be projected. Steel-frame construction has, of course, been employed, with Portland stone facing. The façade has an unbroken cornice over 300 ft. in length.

The public entrance at the corner of the building leads into a magnificent rotunda (fig. 4). As will be seen, this is of noble proportions, and marble has been freely used in its decoration—floor, walls, and pillars all being of this material. In the centre is an ornate metal brazier which is illuminated to give a cheerful welcoming glow. This is eventually to be replaced by a fountain designed by a local lady art student. On one side is the cashier's desk, at which inquiries can be made, and in another part of the rotunda is a "quick repair" service counter. Here and there showcases are placed, in which examples of appliances and lighting fittings appear. The lighting of the rotunda is carried out with cube-shaped fittings of special design.

Beyond the rotunda is a showroom (fig. 7), in which spacious apartment are arranged selected appliances such as cookers, washing machines, vacuum cleaners, &c. The principal illumination is carried out by means of artistic bowl fittings.

The main showrooms are on the lower ground floor, and are reached by way of a broad staircase with a wrought-iron and bronze balustrade. Here there are separate displays of lighting fittings and radiators, but the principal feature is a series of apartments around the main showroom all laid out to demonstrate electrical appliances in the correct settings. The lighting fittings in each room are easily detachable, so that any selected model from the general display can be substituted for the benefit of a visitor.

Fig. 3 illustrates the model lounge. It is tastefully furnished, and the electrical fittings fall naturally into the general scheme. An imitation coal fire heats the apartment and the principal lighting comes from an ornamental shade fitting in the centre of the ceiling. There is ample auxiliary illumination from floor and table standards and brackets over the fireplace. Outside the window is a suitably-lighted garden scene. This system has been adopted for the other apartments; for instance, from the drawing-room window a little garden is seen, complete with a lawn, and the dining-room is similarly treated.

Fig. 2.—The Main Staff Entrance.

Fig. 3.—The Lounge.

The model bedroom is beautifully decorated and furnished, and is equipped with an ultra-violet ray apparatus, a hair drier, &c.

Another very handsome apartment is the bathroom (fig. 6), which is perhaps more completely electrical than any other section of the showrooms. The principal

appliance is a large automatic water heater; there are also electrically-heated towel rails, a small wall radiator (fixed well out of reach of the bath), and a shaving mug.

Fig. 4.—The Rotunda.

The model kitchen is adequately equipped for cooking, washing and other demonstrations. On the lower ground floor there is a small theatre (fig. 5), fitted with kinema projection apparatus. This has seating accommodation for 70 people, and is used for various kinds of demonstrations and the display of films. Electricity is freely used in all parts of the building. A novel idea is an all-electric caretaker's house within the building, consisting of five rooms on one floor.

Carliol House was designed by Mr. L. J. Couves, and the contractors for the construction were Messrs. Stephen Easten, Ltd., Newcastle. The equipment of the building was carried out by a number of firms, and mention may be made of the following: The interior wiring was provided by the Macintosh Cable Co., Ltd., which supplied over 40,000 yd. of "Maconite" wire and cable. Six lifts (with two more to be installed later) were put in by Messrs. Smith, Major & Stevens, Ltd.; four of these are passenger lifts fitted with dual control, enabling them to be operated either by an attendant or by a passenger, and with special safety devices. The Automatic Telephone Manufacturing Co., Ltd., provided the automatic telephone exchange, Messrs. A. Reyrolle & Co., Ltd., switchgear, and Messrs. J. A. Crabtree & Co., Ltd., "Crabtree" switches. Lighting fittings were supplied by the General Electric Co., Ltd., and Metro-Vick Supplies, Ltd. In addition to these companies, other electrical concerns have provided all kinds of exhibits.

The new headquarters serves as a further indication of the importance which the company attaches to domestic consumers, for the whole of the showrooms is designed to attract that particular class, and educate them to further uses of electricity. It will be remembered that while the North-East Coast has been severely hit by the years of depression in the shipbuilding and other industries in the area, the Newcastle-upon-Tyne Electric Supply Co., and its Associated Companies have shown consistent progress which has been almost entirely attributable to the growth of the domestic load.

Fig. 5.—Demonstration and Kinema Theatre.

Fig. 6.—The Bathroom.

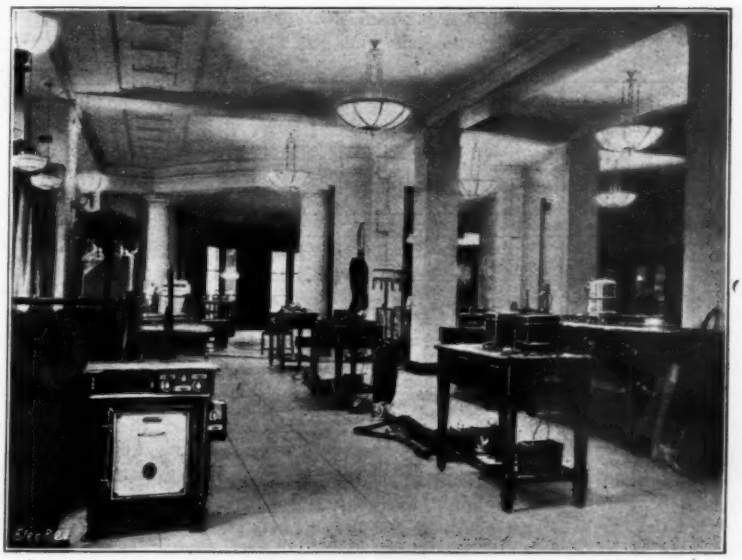


Fig. 7.—Ground Floor Showroom.

Our Overseas Electrical Markets.

Trend of import trade of Australia, New Zealand, India, and South Africa. Factors affecting purchasing power.

IN continuation of the survey which appeared in our issue of February 10th, we now review the economic situation in Great Britain's principal electrical markets, *viz.*, India, Australia, New Zealand, and South Africa for a further three months. The accompanying charts show the trend of electrical imports into those countries.

It is noteworthy that imports into Australia of electrical machinery and apparatus keep up in spite of the attempts to develop the manufacture of certain lines.

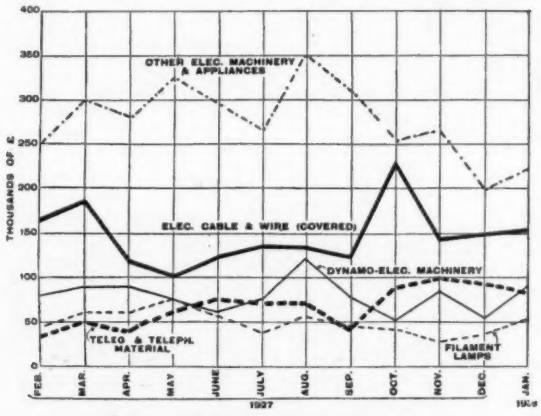


Fig. 1.—Australian Electrical Imports.

For the seven months ended January, 1928, the grand total was £4,437,000, against £4,377,000 in the corresponding period of 1926-27. At the same time, New Zealand's electrical imports have been well maintained. As to India, in February her purchases abroad of electrical apparatus showed an increase of 25 per cent. over those of four months previously, Great Britain's share showing little change.

Australia.

Although financial leaders in Australia are still recommending economy in public expenditure, there has been a recovery in both wholesale and retail trading

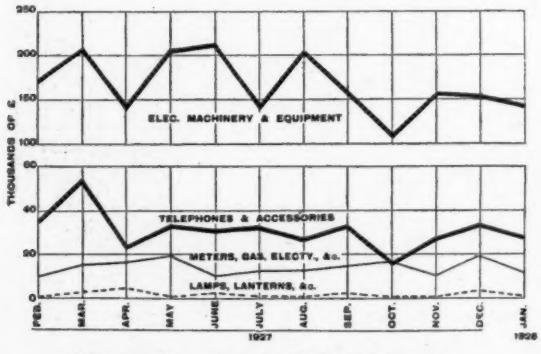


Fig. 2.—New Zealand Electrical Imports.

as a result of the brighter outlook caused by the rains which have fallen throughout nearly all the Continent except the far west and north-west. It is felt that wool growers and farmers will now spend their money more freely. The total sales of wool in the Commonwealth for the season are said to have aggregated £56,000,000 in value. Prospects for the coming clip are regarded as promising, while the fruit crop is reported to be good and the area under wheat is expected to be larger than last season. The employers are hoping that more reasonable views will be taken by labour as a result of the conferences which Mr. Bruce is endeavouring to arrange on the lines of those initiated in Great Britain by Sir Alfred Mond.

The inclusion of Sir Hugo Hirst in the British Mission which is visiting the Commonwealth is a "bull point" so far as the electrical industry of this country is concerned. It will be within the province of the delegation to confer with the authorities and leaders of industry there on the question of the desirability of attempting to develop the production of highly-specialised electrical apparatus in Australia or on the other hand, whether it would not be more economic to buy it in the homeland, which is necessarily better suited to such manufacture owing to the wider market and more extensive opportunities for improvement of design and exchange of experience.

In connection with the building of electric motors, it has been found that the 45 per cent. duty on British machines and the 60 per cent. duty on German machines are not high enough to keep out imports of either make. A similar complaint comes from the switchgear makers, who have applied to the Tariff Board for increased protection. As a result of objections raised by the British General Electric Company, a conference between the various parties has been arranged. It is significant

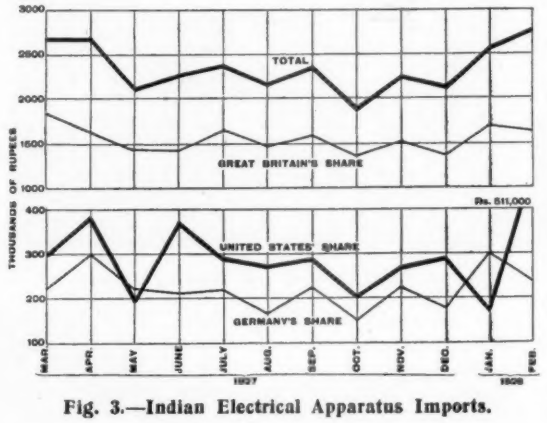


Fig. 3.—Indian Electrical Apparatus Imports.

that the New South Wales Chamber of Manufactures has warned British manufacturers not to start business in Australia unless the Commonwealth Government guarantees higher duties. In the domain of electrical manufacture, developments are in the direction of an increased output of domestic labour-saving devices. The Australian Government is expected to be in the market before long for electric railway equipment.

The total imports of merchandise during the six months ended December last were £80,604,000 in value, compared with £83,780,000 in value during the corresponding period of the previous year. Exports during the same six months were respectively £68,916,000 and £60,820,000. It must be pointed out, however, that exports of bullion and specie during the last six months of 1927 amounted to only £2,724,000, whilst in the corresponding period of 1926 they totalled £9,171,000.

New Zealand.

Official statistics relating to the employment of farm machinery in New Zealand, show that the use of electric motors has advanced considerably—from 3,451 in 1925 to 8,436 in 1927. The increase is ascribed to the great development in the production of hydro-electric power.

The use of electricity for manufacturing and domestic purposes is also extending rapidly, and it is estimated that the supply is available to 90 per cent. of the population. This percentage is likely to grow, for the Arapuni plant in the north of North Island is nearing completion, while the Waikaremoana plant of 32,000 kW in the Hawkes Bay district is being erected, and a further installation of 30,000 kW is contemplated in South Island.

In commenting on this progress, the Wellington correspondent of *The Times Trade and Engineering Supplement* says there is room for the marketing of a large number of electrical appliances, especially cooking ranges, provided the first cost is low and the energy prices are reduced. This will apply more particularly to many rural consumers, who are able to obtain electricity, but are beyond the reach of gas plants. Where there is competition between gas and electricity, the field for cooking appliances is well filled by gas companies, whose outputs increase year by year with increased sales of cookers or stoves and hot-water services. The economic position of the Dominion generally has improved. The relation between exports and imports is normal again, and various indications point to an increasingly favourable balance of trade in the near

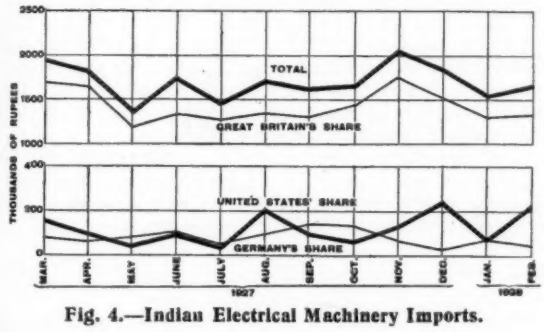


Fig. 4.—Indian Electrical Machinery Imports.

future. Meanwhile the banks are adopting the cautious policy of keeping their deposit and overdraft rates at a fairly high level. Unemployment is still rather above the figure of twelve months ago, but it appears to be diminishing, except perhaps in the building trade of Auckland. The trade returns for the financial year just ended show a healthy credit balance of exports over imports of £10,500,000, compared with an adverse balance of £2,500,000 in the preceding 12 months. Exports totalled nearly £55,000,000, compared with nearly £45,700,000, while imports amounted to approximately £44,500,000, compared with £48,200,000.

Home trade had shown clear indications of improvement by the middle of March, and money was circulating more freely.

India.

So far as statistics of India's foreign trade are available this year, they show a fairly good export balance. While Great Britain's share in the import trade has remained fairly steady, that of the United States has advanced slightly owing to larger sales of motor vehicles, mineral oil and raw cotton. The volume of imports and exports is greater than a year ago.

The agricultural prospects are distinctly good. The recent decline in the exports of raw cotton need not be considered as an adverse factor, for there are expectations that the coming crop of that important staple will be 20 per cent. above the 1926-27 figure. This is an unofficial estimate: the official final forecast is 5½ million bales against 5 millions. Other leading crops are expected to be satisfactory. Meanwhile exports are on a higher level than a year ago in a number of commodities.

Import business in cotton piece-goods has been steady, and in iron and steel there has been an increase. It cannot be said that the depression in the Bombay textile mills has lifted, but looking at Indian economic conditions as a whole, it is satisfactory to find continued prosperity in the Bengal jute industry, owing to the large crop and the well-maintained demand for manufactured jute goods.

The railway situation is satisfactory; the programme of new construction is very extensive, and, subject to detailed examination, covers the addition of 7,000 miles during the next five years.

South Africa.

The gold output from the Transvaal mines has been consistently good this year, that for March constituting a record, the value being £3,728,865, or £260,300 higher than February and £71,700 higher than March, 1927. Similarly, the output of diamonds has been increasing. Monthly production figures are no longer obtainable, but statistics for the year ended December last show a total value of £12,392,300, as compared with £10,683,600 in 1926. Now that the mines have finished their stock-taking, more activity in the purchase of various supplies is expected. The Government and municipal authorities are in the market for various

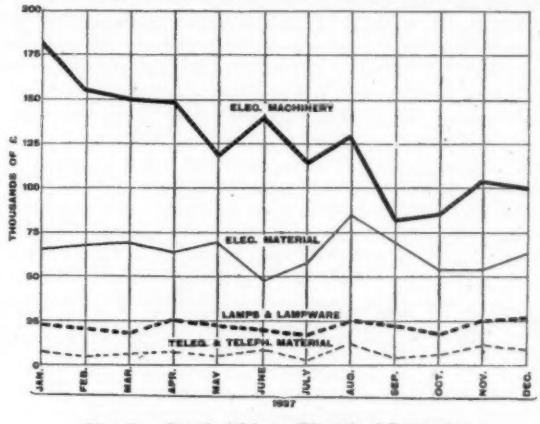


Fig. 5.—South African Electrical Imports.

descriptions of electrical plant, from lifts and pumps to switchgear and transformers. As has previously been reported in our pages, the municipality now seems to have won its freedom to erect a new electricity generating station instead of taking a supply from the super-station erected on behalf of the Electricity Supply Commission on the Witbank coalfield, some eight miles distant. The first step towards the installation of the new plant which is to complete the new power station, is a call for tenders for the supply of two 10,000-kW sets. The balance of the new plant required is four boilers, three cooling towers, extensions to the present buildings to accommodate the plant, including additions to the coal-handling and ash-removal plant, and switchgear. It is expected that the power station will be completed within two years; its total cost is estimated at £510,000, of which some £220,000 has been spent.

Building activity, which slackened somewhat early in the year, shows signs of resumption, and a good demand for material is expected in the near future. Amongst the more important works planned are housing schemes in Cape Town, Port Elizabeth, Johannesburg, and Germiston; drainage and hotel extensions in Durban; and a dam at Pretoria. Manufacturing industries generally have been well employed.

With regard to the important maize crop, it is estimated that this season's yield will exceed that of last year by 1,600,000 bags. From Durban it is reported that the sugar yield will be 20 per cent. more than last year. Prices have been steady. Despite drought in certain districts, the wool season has been a profitable one, and a high level of prices has been attained. From the cotton-growing districts reports are also fairly satisfactory.

During the quarter ended February 29th last, imports were nearly £500,000 in value more than in the corresponding period of 1926-27, while exports showed an increase in value of £2,524,000.

Overhead Line Regulations.

A Technical Criticism of the New Code.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E.

IT is so very easy to criticise the ideas and practices of others! There is useless and helpful criticism, dangerous and poisonous criticism, as well as many grades coming between these extremes. The most callous and destructive critic and reviewer usually fastens upon one weak point and neglects the good and strong for the express purpose of condemning the whole. Constructive criticism is desired when it can be made helpful, and this is the viewpoint in a matter of this important nature, where the electrical development of the entire country is involved.

Up to the present time we have adopted for this country the "main transmission" system, voltage, and frequency. As yet we have not decided upon *the* primary distribution (symmetrical polyphase) system,* even though there is little choice available; *the* secondary distribution system* is also in embryonic form, but the voltages are about definitely fixed at 400/230. Now come the constructional safety standards, which leave us with the question on our lips—are they suitable, just, and proper for the anticipated electrical development of this country's rural and urban areas? It is self-evident that constructional safety standards based on factors of ignorance are inherently wrong, and that the nearer the standards approach known and proved facts and factors capable of being calculated, the closer we shall approach the most just and perfect set of constructional safety standards.*

The technical Press, technical associations, committees, engineers responsible for the operation of electricity undertakings, and others, all have done much talking or writing about revision of the Regulations for Overhead Lines. Whether the right kind of helpful information has or has not been given to, and accepted by, the Electricity Commissioners, can perhaps be gathered by the contents of the new Regulations now before us; it is quite certain that all and sundry expected the revision to facilitate electrical development.

As in the earlier Regulations, two distinct loading conditions are given. The revision permits 1/16-in. ice reduction for the light loading and 1/8-in. ice reduction for the heavy loading; these reductions are helpful to some extent. They respectively provide for a greater overhead clearance of conductors for equal span length and equal size and kind of conductor used; in other words, they permit an increased length of span for maximum sag conditions. But it should not be overlooked that the allowable stress in line conductors is the same, whether the loading be 3/8-in. ice or 3/16-in. ice coating, *i.e.*, the allowable stress is 12.0 tons per sq. inch in the case of each loading, for copper. The 3/8-in. and 3/16-in. ice loadings,* respectively, provide for a slight reduction in the size of line supports, but the decrease in size for equal span length is only slight. There is also another point to be considered: as the majority of secondary-voltage lines are (or will be) operated at or about 400 volts between phase-conductors, rural and other overhead development can be more economically and satisfactorily met by the increase from 325 to 400 volts, earthed or non-earthed. The former voltage is just as dangerous to life and property as the latter, with many advantages in favour of using the standard of 400 volts. A decision in favour of the 400-volt value is desirable, as it involves no greater electrical hazard, it conforms to a standard and generally used voltage and practice, it will not increase the mechanical hazards, and, depending on the electrical system used, it will reduce the cost of distribution. If the 3/16-in. ice loading can be allowed for 325 volts (earthed or otherwise), there is no reason whatsoever why it cannot be allowed for 400 volts; in other words, a 400-volt *delta*-connected system, which is generally or almost exclusively non-earthed, is subjected to the 3/8-in. ice loading—on the other hand, the Rule practically enforces general use of the much better system of distribution, *i.e.*, the star-connected 4-wire, *and this with the* 3/16-*in. ice loading*, which offers advantages in the form of initial cost, of decreased hazards, decreased voltage strain, &c.

Relaxation of minimum height is a desirable change. From the above we see that a decrease in conductor loading permits a gain in overhead clearance. Added to this advantage, the Regulations specify a further reduction of from one to five feet, and the minimum-voltage limit for this rule (1.0 to 3.0 ft. reduction) has jumped from 325 V to the enormous figure of 66,000 volts. Now, if we are to judge this case, it would seem apparent that no justification ever existed for limiting the minimum overhead clearance to 325 volts, and there would seem to exist much less reason for limiting the 3/16-in. ice loading to an *odd* and low voltage of 325 volts; 325 volts will kill just the same as 400 volts, and the minimum voltage limit would be quite justifiable at 3,300 volts, and would thus very greatly facilitate electrical development in rural areas in general.

Another point, small but worthy of mention: in view of the fact that the mechanical loadings have been reduced, the use of the minimum breaking strength of conductors has been increased by 100 per cent., *i.e.*, the minimum breaking strength has been increased from 609 lb. to 1,237 lb. for copper, or *double* what it was with the heavier and more hazardous loading. As this represents only one condition of minimum allowable size of conductor, it has little importance as compared with the above mentioned, which may involve the majority of secondary lines in the whole country.

Another interesting change comes under "Provisions to prevent danger," which reads: ". . . the resulting leakage current shall not be *less* (?) than twice the leakage current required to operate the devices which make the *line* dead." Apparently the amount of leakage current has been left to the particular operating device used, without any stipulation as to limits. As the a.c. voltage rise of an earthed part above earth potential is equal to the earth current times the impedance of the earth conductor and/or connection, and as this must be kept below a value which is dangerous to life, we are limited to a voltage much lower than is the standard practice in this country and a lower voltage than 125 volts a.c. ($125 \times \sqrt{2} = 177$ volts d.c.) above earth has been known to prove fatal. In the matter of earths and earthing we must first install, and then maintain, a proper earthing system before we can expect the right protection. Equi-impedance intervals and an equi-impedance area are the required conditions, and are quite different to "*equidistant points* of earthing." Apart from this, *earth-plate* installations are the general practice, yet pipes driven in multiple are known to be better, and water-piping systems better still: the minimum resistance for earth-plates is around three ohms, but in practice it is more often 15 ohms, and during dry periods it may be nearer 25 ohms, which would mean an earth-current flow of, say, $230/25 = 9.2$ amps. As a device may not operate under twice this current, why limit earth-leakage current to any particular device? A device may operate at less than five amperes or not operate at less than 50 amperes, yet both conditions appear to conform to the "provision."

* Discussed at length in the writer's forthcoming book, "Distribution of Electricity by Overhead Lines," now in the press.

There is still another point. No improvements have been made in the methods of line construction to conform more closely with better and safer and cheaper practice* for equal line insulation and equal mechanical strength and equal factor of safety: for example, such practices as bonding insulator pins, bringing the earth up and in contact with wood supports, duplicating insulators per conductor for lines strung along or within 150 ft. of a public road, using double conductors over crossing-spans, &c., all these practices tend to either increase the costs or increase the hazards of a line and system—some for one of the undesirable features and others for both.

As regards the strength of support foundations, the factor of safety against overturning has been omitted from the Regulations. Surely this is at least as (or more) important than the factor of safety for the supports themselves? On the other hand, as the volume, weight, and resisting area of foundations, and the load which comes on the supports, can be determined with reasonable accuracy, why multiply the resistance to uplift by a *high* factor of safety? The question remains: do we know the loads which will come on the supports, and are we certain of the exact form and volume and weight of materials it contains? This unknown factor is also a variable, depending on the form of foundation, weight, depth, soil, materials, location, and other factors.

With regard to wood poles, why leave strength requirements the same when (for equal span length and equal size and kind and number of conductors) two effective loadings have been deduced from them? Still more important: why enforce a grade of strength requirements for heavier loads and greater hazards, such as obtain at crossing spans, also along roads in well-populated areas, and the same grade for more lightly loaded, safer, and relatively insignificant lines located in remote or out-of-way country places? The last-mentioned districts are clamouring the most for economical supplies at satisfactory rates to consumers, and should, as all the above remarks tend to emphasise, be subjected to the lesser loading and other conditions facilitating supply, cost, and price.

Now that we have the new Regulations, can we say they do (or do not) facilitate future electrical development? The best reply the writer can give is that they are a help in the right direction, but are in an incomplete and inadequate form.

(To be concluded.)

* *Loc. cit.*

Novel Electrical Sports.

The Besco Supply Undertaking held its annual sports last week. This year it was decided to present the usual events under circumstances in keeping with the nature of the undertaking's work.

By "STAN DARD."

FOR the impedance race only two components—or rather, competitors—entered. The obstacles to be tackled were of a formidable character, including some large squirrel-cage motors, a 10,000-kVA transformer, a two-storey sub-station inside palings, a scrapped rotor and power condenser, while in the concluding stage several Helsby reactances had to be jumped through and some tight-rope walking performed on a stretch of overhead line. It was neck-and-neck for a time, but one competitor (who had been dragged forth from the lunch tent) was labouring under considerable wattless and began to lag—refusing to budge beyond the power condenser. His rival, now undoubtedly leading, became so over-excited that he collapsed inside a reactance and even No. 5 boiler blowing off did not rouse him. It was discovered later that no one had been told off to make the overhead line dead. The tight-rope would have been the final obstacle in any case.

In lieu of an egg-and-spoon race it had been proposed to use a couple of Orsatt instruments (borrowed from the chemist's lab.) balanced on two shovels. The chemist, however, returned suddenly from his holiday, and with much cold H_2O and many vitriolic remarks tanned the scheme. His unsporting attitude was much commented upon—particularly by the boiler-house men, who regard the "chemist's shop" with increasing suspicion. However, some lamps supported by their caps on slide-rules filled the breach admirably.

Another interesting event followed. Several slot-meters had been erected in various places—one in the pump-house basement, another ten feet up on the stores wall, and one in a hole 1 ft. wide under the office stairs. The prize went to the competitor who reached home in the shortest time and had read the meters and counted the cash correctly. Much amusement was created by Sandy McGrath (of "Mains") going round the meters twice to check his figures. Questioned afterwards about losing the prize, he said it was worth it.

The thrilling stack race almost ended in tragedy. At a toot from the station buzzer four fellows set off to scale the smoke-stacks. Young Bouncer (of the Operation Dept.) at once took the lead—with his usual confident air mounting two rungs at a time. But thirty feet up, however, he missed his footing and fell on his head. When picked up he appeared uninjured physically, but there was a strange look in his eyes. He has since been transferred to the test house.

An exciting contest took place in the cable-drum race. Several empty drums were requisitioned, a pair of men taking each; one man pushed while the other tried to keep his footing on top. The drums had to be rolled from the stores yard to the main gate. Strange to say, this race was won by the general office entrants.

The tug-of-war was a fiasco. A length of lead-covered cable had been procured, and at first the mains dept. team refused to take part because a non-belted type was to be used. This meticulous objection was generally considered to be a sign of cowardice. When a team of district engineers was pulling right heartily against the station staff, the cable parted in the middle without any warning; it was then found that the "rope" was really two separate pieces of cable which had been attached merely by a cleverly concealed joint in the lead covering.

There was, of course, a relay race, in which departmental teams competed for a 50-inch slide-rule presented by the president of the Athletic Club. The stages were: power station to stores, stores to mains dept., "mains" to general office, office to test house, test house to showroom. (The large crowd which collected outside the showroom was at once tackled by the manager; one cooker, nine irons and three kettles were disposed of, while a lady promised to buy a washing-machine when her ship reached port.) The relay race was won by the station team. The members don't know quite what to do with the 50-in. slide-rule; it is suggested that it might be hung in "A" boiler-house, but in an endeavour to improve the station efficiency the prize might disappear for ever—under one of the boilers.

Much speculation was aroused with regard to the steeplechase. A fault was supposed to have taken place on a T-off on the southern feeder three miles away. Leaving the mains office by car, competitors were to

dash to the sub-station there, leave the car, cross two ploughed fields, jump all the hedges and brooks, and reach the fault; having climbed the pole with the annoyed goat tethered at its base, proceed on foot to the colliery at end of line, return to the sub-station, and (pretending to find car useless) go on foot to Headquarters. To increase hazards, the committee hoped for at least a heavy rainstorm. When the bell rang, none of the intending competitors (rather wisely) made an appearance.

Great interest was evinced by the ladies in the buried cable search—a guessing competition. The prize-winner was ultimately disqualified, as it was found that she had been receiving remote indications from her young man (employed in the drawing office) who was perched on the transformer house.

Refreshments were provided by the cookery experts of the showroom; having been assured of plenty of hot water, they made tea in the weigh-tank. A coconut-shy was a much-appreciated side show. The coconuts appeared to be well earthed—being, in fact, secured in place by Chatterton's. A stoker who had bought a large cake at the refreshment stall and was trying to munch it, excitedly aimed at a coconut. Aim, Chatterton's, and cake proved 100 per cent.—the coconut was shattered.

A novel side-show in the shape of a rodeo had been organised. The star part was played by a bull kindly lent by an electro-farmer near East Grinstead, and attempts were made from electric vehicles to lasso it with c.t.s. The thoroughly electrical environment seemed to have exasperated the animal, for instead of proving tractable, it made great play with its horn arresters and charged the electric vehicles in a manner to which they were unaccustomed. Thus the attack became a retreat, in which the electric vehicles were joined by the crowd. Entering the main gate was the showroom manager, who was carrying his latest plaything—an ultra-violet-ray set. The bull pulled up short and, misled by the artificial sunlight apparatus into thinking that the showroom manager was its master, it turned and meekly trotted into the commissionaire's cabin.

This concluded a pleasurable afternoon, everybody present having sociably participated in a final race not on the programme.

Developments in Current-Transformer Design.

Some of the advantages to be derived from the use of Mumetal for the cores of current transformers.

By "BREAKER."

THE only suitable design of current transformer for use on large systems where heavy fault currents are likely to occur is the straight-through or single-turn, bushing type, having a primary conductor of the same current-carrying capacity as the circuit cables. Limitations of output and difficulties in arranging compensation have so far limited its application for metering purposes to circuits of about 300 A and upward. For smaller current values, the primary ampere turns are insufficient to provide the necessary accuracy for metering purposes, and the current transformers can only be used for actuating relays, oil-breaker tripping devices, and the like, where ratio and phase-angle errors are of little or no account.

The invention of the new magnetic alloy Mumetal has, however, solved a great number of the difficulties that had to be surmounted, and brings the universal application of the single-turn current transformer more nearly within the bounds of possibility. The difficulties to be overcome are discussed in these notes, and the results of tests are given which show that it is now possible to extend the lower limit of this design very considerably. On e.h.p. systems the normal full-load current is never very high, and the type of current transformer with only one primary turn has accordingly a small number of ampere turns. The output of a transformer is proportional to the impedance of the secondary burden or (with a constant current) to the secondary terminal e.m.f., which is connected with the flux by the equation—

$$E = 4.44 \, T \, f \, \phi \, 10^{-8} \quad \ldots\ldots(1)$$

whence

$$\phi = E \, .10^{8}/4.44 \, T \, f \quad \ldots\ldots(2)$$

For a given secondary burden the flux necessary to generate the requisite secondary voltage will vary universely as the number of turns, and the flux density, of course, will vary with the cross section of the magnetic circuit. The flux will require a certain exciting current to maintain it, and this current will vary directly as the length of the magnetic circuit and inversely as the number of primary turns. There will also be an actual energy loss in the magnetic circuit proportional to the weight of iron and inversely proportional to the primary turns. For a given secondary voltage or loading, therefore, if the losses are to be small in proportion, then the number of turns, the cross section of the iron core, and its permeability must be high, while the length and weight of the magnetic circuit should be as low as possible.

With the single-turn current transformer the primary current is fixed by circuit conditions, and as there is, by design, only one turn, any control of the exciting and energy-loss currents, upon which the ratio and phase-angle errors depend, can only be obtained by manipulating the cross section of iron, and so controlling the flux density. It might be thought possible to carry out this procedure indefinitely, and by increasing the cross section of the core to utilise this type of current transformer for even the smallest primary currents, but a limit is reached beyond which the addition of further iron is of very little advantage, quite apart from the cumbersome arrangement such a large core would produce.

When the core of a transformer is increased in section in order to give it a larger output, and all other factors remain constant, the flux density decreases, but the weight of the core increases. If the permeability remained constant there would be an advantage in increasing the section of iron almost indefinitely, because the energy and excitation losses would decrease at a faster rate than the weight of the core increased (being proportional to $B^{1.6}$, approximately) and the length of iron path would remain constant. But, unfortunately, the permeability of Stalloy and Lohys does not remain constant but falls away with very low induction density. In fig. 1 is given a general curve showing the energy and exciting losses of a current transformer built up with an 18-mil Stalloy iron core. Suppose the transformer is operating with a flux density in the core of $B = 4{,}000$ lines per cm.^{2}, and with the secondary burden corres-

ponding to this flux density, the energy and excitation losses cause the ratio and phase-angle errors to exceed the limits allowable by the B.E.S.A. specification No. 81.

The total losses at this flux density are shown at A in fig. 1; if the core section be increased until the flux density is reduced to 3,000 lines per cm.², the total losses will now be the addition of energy and excitation losses

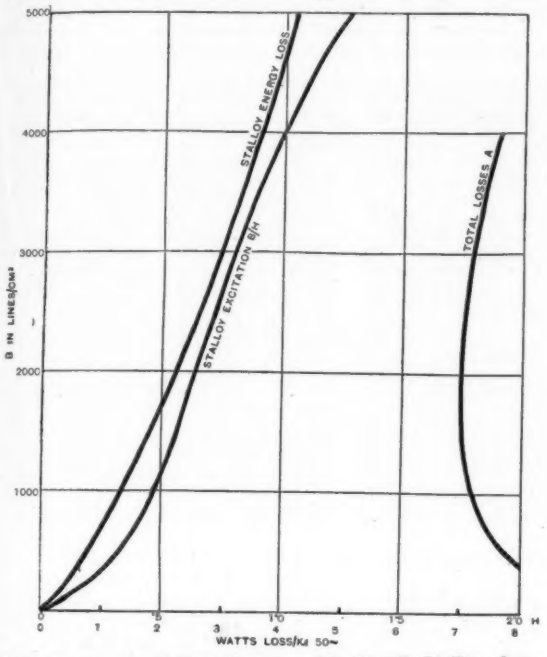


Fig. 1.—Losses of Transformer with 18-mil Stalloy Core.

as before, but the energy loss will be increased in the ratio of three to four due to the weight of the core being increased in this proportion. A curve of total losses has been prepared in this way (see fig. 1), from which it can be seen that they decrease with a decrease of flux density up to a point, after which they increase again. It is not, of course, permissible to add

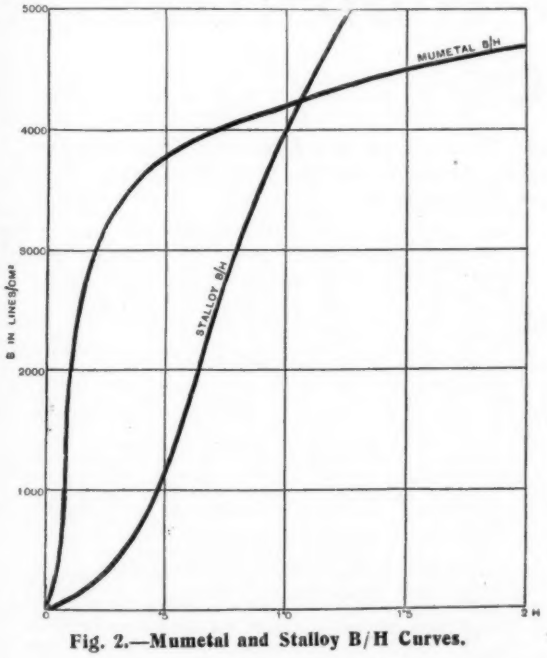


Fig. 2.—Mumetal and Stalloy B/H Curves.

these losses arithmetically in the ordinary way, but this serves to illustrate the argument that there is a limit beyond which the addition of iron does not assist a current transformer.

What is required is a magnetic material which possesses both high initial permeability and high permeability with low induction densities. Such properties are to be found in Mumetal, which has an initial permeability of between 5,000 and 10,000, very low hysteresis losses, and a correspondingly minute coercive force. The B/H curves for Mumetal and Stalloy are given in fig. 2, and the advantages of the former over the latter for induction densities up to 4,000 lines per cm.² are plain. If the total losses of a current transformer were to be assessed and added, as in fig. 1—in this case a Mumetal core was used instead of Stalloy—it would take the general form indicated in fig. 3, from which it can be seen that a continued advantage is to be obtained by increasing the core of a Mumetal transformer until much lower induction densities are reached than with Stalloy.

In order to definitely confirm the advantages of Mumetal over Stalloy for current-transformer cores, two single-turn current transformers were built up, one having a core built of 18-mil Stalloy ring stampings of $1\frac{1}{2}$ in. internal and $3\frac{1}{2}$ in. external diameter, and $1\frac{3}{4}$ sq. in. cross section, and the other a similar core but

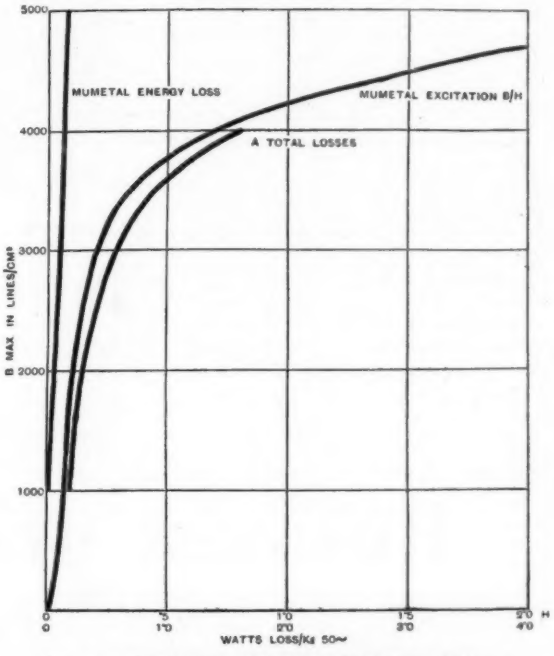


Fig. 3.—18-mil Mumetal-core Transformer Losses.

built of Mumetal. The two transformers were tested at 50 cycles for outputs at B.E.S.A. rating with the following results:—

Ampere turns.	Mumetal.	Stalloy.
200	17 VA	3 VA
300	35 VA	7 VA
400	40 VA	12 VA
500	57½ VA	21 VA

Apparently the Mumetal core makes the transformer:
6 times greater in capacity than Stalloy with 200 a.t.
5 times greater in capacity than Stalloy with 300 a.t.
3½ times greater in capacity than Stalloy with 400 a.t.
2½ times greater in capacity than Stalloy with 500 a.t.

The approximate value of the flux density obtaining in each transformer when operating these secondary burdens would be:—

Ampere turns.	Mumetal.	Stalloy.
200	3,590 lines/cm.²	597 lines/cm.²
300	4,650 ,,	920 ,,
400	4,030 ,,	1,200 ,,
500	4,620 ,,	1,670 ,,

Referring to the B/H curves given in fig. 2, it will be seen that these values of B max. check up with corresponding values of H sufficiently well to suggest that the test results are reliable. There is no doubt, therefore, that by the use of Mumetal it is possible to build single-turn current transformers with B.E.S.A. accuracy down

to 100 amperes of primary current, and possibly for even much smaller sizes than this, provided a reasonable core section is used. There still remains a further difficulty to overcome, however, before this design can be used for these smaller sizes, and that is one of compensation.

With a 100/5-A single-turn transformer there are only 20 secondary turns, and the closest compensation obtainable by varying the winding by one turn is 5 per cent. This entails the transformer being either far too

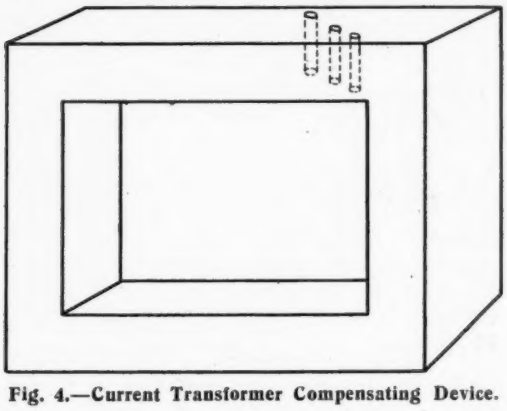


Fig. 4.—Current Transformer Compensating Device.

high or far too low in accuracy; the difficulty can be overcome by using a one-ampere secondary, but this involves the various instruments operated being suitable for a normal full-load current of one ampere, which is not always possible. Neither for considerations of standardisation is it altogether desirable.

Among several methods that have been tried for obtaining closer compensation than one turn with this type of transformer was the use of the last secondary turn of flex, part of which could be wound backwards to give a demagnetising effect. Unfortunately this arrangement acts as a short-circuited turn around the iron core, and its effect varies very considerably with variations of secondary burden, and is therefore unsatisfactory. If, however, the section of the core has a series of holes drilled in it at $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ of the width of it, staggered in such a manner that the core section is in no place reduced by more than the area of one hole, it is possible to wind on a turn that will embrace either $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ or the whole section of the core. Such an arrangement is shown in fig. 4, and was tried out on a 200/5-A single-turn type transformer upon which one turn gives $2\frac{1}{2}$ per cent. compensation with the following results :—

Secondary turns.		% Ratio error.		% Variation.
39	...	+1.7%	...	.7%
$39\frac{1}{4}$	...	+1.0%	...	.7%
$39\frac{1}{2}$	...	+ .4%	...	.6%
$39\frac{3}{4}$	...	− .3%	...	.7%
40	...	− .9%	...	.6%

This arrangement is unaffected by variations in secondary burden and allows easy and delicate adjustments to be made. The fact that each $\frac{1}{4}$ turn should give an equal effect is somewhat surprising in view of the fact that it has been shown experimentally that the flux distribution is by no means even throughout the core, but apparently it is near enough to afford the easy and fine adjustment required.

Mumetal alloy has made it possible to extend the single-turn current transformer for quite small currents, and enables useful outputs at B.E.S.A. ratings to be obtained, while the difficulties of compensation can be overcome in the manner described or in any other suitable way.

This constitutes decided advancement in current-transformer design, and will hasten the end of those of the multi-turn type with their inherent weaknesses.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

Window Display Prize.

The Bradford Corporation Electricity Committee has decided that the second prize of £20, awarded by the makers of an electric vacuum cleaner to the electricity showrooms in a recent window-display competition, should be distributed between the members of staff responsible for the windows, which were dressed out of business hours.

A Newcastle "Shopping Guild."

A special meeting of the retail section of the Newcastle-on-Tyne Chamber of Trade was held last week to consider a report concerning the Electric Supply Shopping Guild. The chairman said that the employés of the Newcastle-upon-Tyne Electric Supply Co., Ltd., had formed themselves into a shopping guild and sought special discounts from 7½ to 10 per cent. from traders for their members. He contended that this was a menace to retail traders. The secretary of the company had stated that the company was not officially connected with the scheme. A resolution was adopted calling upon the directors of the undertaking to inform those concerned that they must not use the name of the Electricity Supply Co. nor seek to take advantage of their occupation to get better terms than the public. The directors are being asked to receive a deputation from the Chamber on the subject.

American Electrical Exhibition.

The 21st annual International Electrical and Industrial Exposition is to be held in the Grand Central Palace, New York, from October 17th to 27th next. Particulars of the display can be obtained from the Electrical Show Co., 124, West 42nd Street, New York.

A "G.E.C. Surprise."

Under this heading *Reuter* states :—"The General Electric Company (U.S.A.), which recently acquired control of Metropolitan-Vickers, Ltd., one of the leading British electrical manufacturing companies, has, according to the *New York Times* this morning, transferred these holdings to Mr. Dudley Docker, of London, who is seeking to unite the British electrical industry into a single powerful unit. The newspaper says that the price paid by Mr. Docker has not been made public. It adds that the Thomson-Houston Co., a British subsidiary of the General Electric Co., intends to participate extensively in a movement sponsored by the Government for the establishment of a national electrical system in England." Mr. Dudley Docker, while agreeing that co-operation between British electrical manufacturing concerns has been arranged, denies that there have been any negotiations for amalgamation or financial arrangements.

Domestic Electricity in Switzerland.

A return lately issued by the Swiss Water Power Utilisation Union shows the rapid progress which is being made in the adoption of domestic electrical appliances in Switzerland. During last year 123,000 apparatus and appliances were installed, representing a load of 126,000 kW, as compared with an addition of 100,000 appliances in 1926. Included in the 1927 total were 15,000 electric cooking stoves, 13,000 tea and coffee-making machines, 42,000 electric irons, 31,500 electric stoves, and 13,000 electric water heaters. Up to the end of 1927 the total number of domestic electric appliances installed in Switzerland is given as 1,163,000, representing a total of 930,000 kW.

New Indian Companies.

Among the concerns recently formed in India in connection with electricity supply are the Tinnevelly Pallamcottar Electric Supply Co., Trichinopoly, Madras, capital 300,000 rupees; and the Thana Electric Supply Co., Atlas Building, Carnas Road, Bombay, capital 300,000 rupees.

A Contractor's "J. & P." Display.

The accompanying pictures illustrate the enterprise of a contractor in the Birmingham district in drawing attention to his business. Surmounting the car is a board directing the

Automobile Publicity by a Birmingham Contractor.

reader's notice to the rear of the vehicle. There a board gives his name and address. At the same time a display advertising Messrs. Johnson & Phillips's wiring system is observed at the side of the car.

Education in Industry.

The New York Edison Company has sent us an illustrated booklet, "Where Industry Clasps Hands with Education, and Both Gain," in which is described the company's system of teaching its employés all about their jobs to the mutual advantage of both parties. It is shown how new employés are instructed in elementary electricity, while there are special classes for distributing station men, linesmen, cable jointers, stenographers, &c. The social and athletic welfare of the workpeople is also catered for and girl employés are even taught the "art of homemaking." It seems rather unwise to fit girls for their jobs *and* for marriage.

Unemployment.

During the week ended April 23rd the number of registered unemployed decreased by 21,470. At that date the total was 1,062,300, as compared with 1,044,757 on April 25th, 1927.

The Cammell, Laird Meeting.

Addressing the annual meeting of Cammell, Laird & Co., Ltd., last week, Mr. W. L. Hichens, the chairman, said that there had been a heavy loss in respect of H.M.S. *Rodney* owing to delays for which they were not responsible. Had it not been for that, the results at Birkenhead would have been satisfactory. There had a been a real improvement in all departments of the business, which he believed would continue. Referring to the burden of rates, he said that the rates on the Sheffield and Penistone works were 150 per cent. more than in 1913, and were still rising. He welcomed the Government's proposals to relieve industry of a great part of that burden. In spite of the economies which they had made, the fall in prices and inadequacy of orders had prevented them from making a profit.

New Australian Company.

Among the companies recently registered in Sydney is the Century Storage Battery Co., Ltd., formed with a capital of £50,000 to carry on the business of electricians and mechanical engineers.

Foreign Loans in America.

Among the foreign loans publicly offered in the United States during the first quarter of the current year were the following:—Municipal Gas and Electric Corporation of Recklinghausen (Germany), $1,500,000; also Oslo Gas and Electric Works, $6,000,000; Westphalia (Germany) United Electric Power Corporation, $20,000,000; Vesten (Germany) Electric Railway Corporation, $1,750,000; Italian Super-power Corporation, $20,250,000; Terni (Italy) Società per l'Industria e l'Elettricità, $12,000,000; the International Power and Paper Co., Newfoundland, $4,866,000; the Saguenay (Canada) Electric Co., $660,000; the Bathurst Paper and Power Co., Ltd., $272,000; and the Nippon (Japan) Electric Power Co., $8,000,000.

Wages in the Engineering Industry.

In view of the failure of the request by the engineering trade unions for a national increase in wages, the London Engineering Joint Committee has decided to proceed with a claim for a district advance. The executives of the unions concerned are being asked to sanction an application for an increase of 2½d. per hour on the basic rates of all grades of engineering workers in the London area.

The Committee on Industry and Trade.

This week the Stationery Office published (at 5s.) another report by the Balfour Committee on Industry and Trade. Its title, "Survey of the Metal Industries," is not fully indicative of its contents for, among other matters, the coal-mining and electrical manufacturing industries are dealt with. The section dealing with electrical manufacturing briefly outlines the history of electricity in this country, and then summarises the information secured by the Committee on various phases of the electrical manufacturing industry. The subjects dealt with include production and productive capacity; the number of persons employed; financial particulars; scale of organisation; trade associations; research; Customs duties; selling arrangements; and overseas trade. The cable, telephone equipment and electric lamp manufacturing industries are given separate attention, and there is a chapter on miscellaneous electrical products, such as batteries and accumulators, instruments, radio valves, &c. A study of the world market and international competition includes sections on the effect of the development of electricity supply in other countries; international connections between electrical firms; and the international trade in electrical machinery and apparatus. Appendices contain statistics of electricity supply in Great Britain and abroad (including hydro-electric development), and particulars of the larger British electrical manufacturing concerns. We hope in a later issue to review the contents of this 500-page volume.

New Showrooms at Macclesfield.

Last week the new showrooms of the Electricity Company of Macclesfield, Ltd., were opened by the Mayor of Macclesfield. The new premises are situated in Mill Street, the main shopping thoroughfare, and are designed on thoroughly up-to-date lines. They have a double front with well-arranged windows, and the principal apartment is a café, which is illustrated herewith. This is attractively decorated and well lighted. The walls are panelled, and in the centre of each panel is an art glass shade with lamps of various colours. On the balcony are flambeau fittings, and arranged around

Café in the Macclesfield Showrooms.

the skylight are a number of "Superlux" globes with coloured lamps. Above the skylight are installed dispersive reflectors fitted with 1,500-W lamps. In a recess the food and beverages are prepared, providing a practical demonstration of the use of electrical appliances. In another division of the recess are electrical laundry appliances which are also shown in use. The outer showroom contains a large but uncrowded collection of lighting fittings and all kinds of domestic appliances. The show-windows are lighted by means of "Cecoray" silvered-glass reflectors with ample auxiliary lighting from the various fixtures.

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A Swedish Industrial Delegation.

This week a party of industrialists from Sweden have paid a visit to this country at the invitation of the Federation of British Industries. They were to discuss with representatives of the F.B.I. a number of questions of common interest, such as tariffs, the interchange of statistics, international exhibitions, &c. The visitors included Mr. J. S. Edstrom, managing director of the Swedish General Electric Co. and vice-president of the Swedish Federation of Industries.

New Catalogues and Lists.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—Catalogue Section J illustrating and describing "Cosmos" electric fans of all kinds—domestic, industrial, ships', &c.

THE HEWITTIC ELECTRIC CO., LTD., Hersham, Surrey.—Publications No. 101, dealing with the company's rectifiers for automatic sub-stations; No. 102, describing rectifiers for sundry applications; and No. 104, illustrating and describing a small standard battery-charging unit.

LIGHTALLOYS, LTD., St. Leonard's Road, Willesden Junction, N.W.10.—An illustrated brochure on "Alpax" aluminium-silicon alloy castings with full details of the physical characteristics of the metal.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—May calendar-blotter, dealing with the "Samson" electric coal cutter. Also descriptive pamphlet No. 50/1 dealing with the company's system for the remote control and automatic protection of coal cutters.

MESSRS. J. G. STATTER & Co., Queen Anne's Chambers, Westminster, S.W.1.—May calendar-blotter, advertising the company's oil switches and circuit breakers.

POPE'S ELECTRIC LAMP CO., LTD., 5, Arthur Street, New Oxford Street, W.C.2.—May calendar-blotter, advertising "Elasta" lamps.

FERGUSON, PAILIN, LTD., Higher Openshaw, Manchester.—A series of illustrated catalogue sections dealing with isolating switches, instrument pedestals, the "Partridge" graphic surge recorder, choke coils, and truck switchgear.

MIDLAND ELECTRIC MFG. CO., LTD., Barford Street, Birmingham.—List No. 168, illustrating and describing "Kantark" cut-outs. Priced.

THE MULLARD WIRELESS SERVICE CO., LTD., Nightingale Lane, Balham, S.W.12.—Leaflet VR68, illustrating and describing a new 4-V, 0.1-A radio receiving valve. Priced.

MESSRS. ROPER BROS., 5, South Anne Street, Dublin.—A gauge for various patterns of plugs and sockets.

THE HARLAND ENGINEERING CO., LTD., 196, Greengate, Manchester.—List No. X63/282, illustrating and describing, with prices, the company's low-pressure air-break switchgear for switchboard mounting.

THE COOPER-STEWART ENGINEERING CO., LTD., 136-7, Long Acre, W.C.2.—A folder containing illustrated particulars and prices of "Sunbeam" and "Princess" electric irons, grills, and toasters.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., Marconi House, Strand, W.C.2.—Leaflet No. 1080, containing a full description and illustrations of Marconi naval receivers, Types R.g. 19 and 19a.

THE BRITISH THOMSON-HOUSTON CO., LTD., Rugby.—Lists No. 653, "Electric Printing Press Equipments"; No. 5030, "Electric Control Gear for Mines and Quarries"; No. 4174, "Ironclad Oil-Immersed Circuit Breakers"; and No. 5301-B, "D.c. Motor Control Panels." Fully illustrated.

MESSRS. CLAYTON & SHUTTLEWORTH, LTD., Lincoln.—Publication 427, describing, with illustrations, "Clayton-Babcock" semi-Diesel oil engines.

MESSRS. FALK, STADELMANN & Co., LTD., 83-93, Farringdon Road, E.C.1.—Catalogue No. 594, containing illustrations, details and prices of "Climax" conduit wiring systems and accessories. Also a price list (No. P. 1238) of "Hitest" wires and cables and "Efesca" flexibles.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—May stock list of motors and dynamos.

Trade Announcements.

Mr. HENRY ESTALL, electrical engineer and contractor, has opened new showrooms at 20, Thackeray Street, Kensington Square, London, W.

Mr. J. W. A. DE VOY is commencing business as an electrical and wireless retailer and installation contractor, at 57b, Market Street, Stourbridge; he asks for catalogues and lists.

Though the Sales Department of the MACINTOSH CABLE Co. has been removed from Derby to St. James's House, S.W.1, the London sales branch still remains at Amberley House, Norfolk Street, W.C.2.

MR. GEORGE TERRY (George Terry & Co., Ltd.) has acquired the business of Mr. A. Heggie, trading as the Meridian Electric Co., 50, Wellington Street, Glasgow, and will continue the business under the same name in partnership with Mr. Heggie.

THE SAXONIA ELECTRICAL WIRE CO., LTD., has appointed Mr. Alan G. Robson, 171, Farndale Road, Newcastle-on-Tyne, sole sales representative in the Newcastle area.

Bankruptcy Proceedings.

J. H. GORDON, 21, Leeds Road, Ilkley, Yorks., electrical engineer.—The receiving order in this case was made on the debtor's own petition. The statement of affairs presented at the first meeting of creditors held recently at the Official Receiver's office, Leeds, disclosed liabilities of £630, against assets of £187. The case, being a summary one, was left in the hands of the Official Receiver as trustee of the estate. The following are creditors:—

	£		£
Electric Lamp Factors, Ltd.	47	Sanderson, Hill & Co. ...	206
Enfield Cable Works ...	30	Sun Electrical Co., Ltd.	54
Marconiphone Co., Ltd.	75	Webster, A.	25
		Wood, J.	40

H. H. SPEKE, electrician, 12 to 17, Bilston Street, Wolverhampton.—Receiving order made April 28th, on debtor's own petition.

P. W. PENTY (Sackville Electrical Co.), 38, Manville Terrace, Morley Street, Bradford.—First meeting held May 8th, at the Official Receiver's office, 12, Duke Street, Bradford. Public examination, May 22nd, at the County Court, Bradford.

C. H. PATRICK, electrical contractor, 132, Much Park Street, Coventry.—Trustee, Mr. W. Hand, 12, Cherry Street, Birmingham, released February 11th.

E. SHAW, electrician, 11, Albion Street, Huddersfield.—Last day for proofs for dividend, May 15th. Trustee, Mr. J. O. Morris, Official Receiver, 12, Duke Street, Bradford.

W. H. GREENALL (Hampton Electric Co.), electrician, Newerne Street, Lydney, Glos.—Last day for proofs for dividend, May 16th. Trustee, Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff.

W. H. WILSON, electrician, Maesyllan Lane, Ruabon.—Last day for proofs for dividend, May 16th. Trustee, Mr. I. D. Hooson, Official Receiver, St. Peter's Churchyard, The Cross, Chester.

G. S. DOUTHWAITE (G. S. Douthwaite & Co.), electrical engineer, 25, Dean Street, Newcastle-on-Tyne.—First and final dividend of 10½d. in the £, payable at 48, Pilgrim Street, Newcastle-on-Tyne.

Company Liquidations.

ERITH ELECTRICAL CO. (BARBER & WHITE), LTD.—A meeting of creditors is called for May 16th, at the offices of the liquidator, Mr. L. G. Darling, 87-89, Aldgate High Street, E.1. Particulars of claims by June 9th.

DORSET & DEVON ELECTRICITY SUPPLY, LTD.—A meeting of creditors is called for May 17th, at the offices of the liquidator, Mr. F. N. Barnes, 24, Coleman Street, E.C. Particulars of claims by May 16th.

RADIO ACCESSORIES, LTD.—A meeting of members is called for June 5th, at 11, Ironmonger Lane, E.C., to hear an account of the winding up from the liquidator, Mr. E. Maloney.

CECIL HODGES & Co., LTD.—Winding up order made by the High Court on April 30th.

QUAIN-RAY LAMP, LTD.—Winding up voluntarily. Liquidator, Mr. W. Hibbert, 166-8, Bishopsgate, E.C.—A meeting of creditors was held at 164, Bishopsgate, on May 10th.

Dissolutions of Partnership.

HUTCHINSON & ATKINSON, electrical and radio engineers, 29, Seaforth Terrace, Harehills, Leeds.—Mr. L. E. Hutchinson and Mr. H. Atkinson have dissolved partnership. Mr. Hutchinson will attend to debts and continue the business alone.

ACCESSORIES (BIRMINGHAM), manufacturers of motor, electrical and radio accessories, 40, Weaman Street, Birmingham.—Mr. D. McGregor and Mr. G. A. P. Woodrow have dissolved partnership. Mr. McGregor will attend to debts.

Guaranteed Installation Work.

The suggestion that the Electrical Contractors' Association should guarantee the work of its members was revived at a recent meeting of the E.C.A. Council, according to the *Electrical Contractor*. The question had been discussed previously and secured substantial support, but other matters had arisen to obscure its importance. The main objections to such a scheme are said to be the difficulty of defining good workmanship or material, the necessity for inspection, and the placing of all contractors on a level in the eyes of the public. But, it is contended, these are precisely the objections which might be advanced against the National Register.

"Whether or not such an E.C.A. guarantee is desirable at the present moment on general grounds of policy is another matter. If the National Register failed to secure the support of the installation trade, then such an alternative proposal on the part of the Allied Associations would assume very considerable importance; but, since the National Register appears to be on the point of increasing its activities, and developing its appeal to the public, the original E.C.A. proposition may not attract the wide support that is essential to its success."

Whiteley's Wireless Enterprise.

During this week Messrs. William Whiteley, Ltd., have been making many special displays and demonstrations. In the Wireless Department some illuminating experiments are being made with a moving-coil loud-speaker, to show how the performance of this class of instrument can be marred by an unsuitable valve combination, and how efficient it is when the correct valves are employed in the proper manner. "Osram" valves were chosen for the purpose of these experiments. During the week parties of 25 have been taken by charabanc to the "Osram" valve works at Hammersmith, where they have been shown how wireless valves are made.

Italian Foreign Electrical Trade.

The appended table gives the value of the Italian imports and exports of electrical machinery, apparatus, and cognate goods during last year, as compared with 1926. It will be noticed that the 1927 totals both show reductions; taking the exchange value of the lira at 92.60 to the £, the imports declined from £3,338,215 to £2,597,690, and the exports from £1,047,860 to £782,330.

	Imports.		Exports.	
	1927. Lire.	1926. Lire.	1927. Lire.	1926. Lire.
Accumulators ...	1,613,476	2,722,642	3,016,400	3,017,542
Battery parts ...	221,605	55,296	204,870	143,220
Electric lamp bulbs	2,138,918	2,375,900	2,250	1,600
Electrical measuring instruments	2,861,571	2,121,200	130,815	278,264
Other electrical instruments ...	43,293,371	45 620,445	10,240,370	12,198.132
Radio apparatus	18,751,035	22,676,327	2,156,929	2,683,901
Telephone and telegraph apparatus ...	49,484,899	51,154,241	1,892,180	3,415,772
Electric furnace carbons ...	13.566 560	21.498.135	1,532.503	2,226.951
Lamp carbons ...	2.796,094	3,650,060	76 262	171,056
Electric cables ...	2,613,509	1,965,323	13,974,638	26,405,373
Electricity meters	14.861,898	35,054,587	776,957	286,543
Insulated wire ...	3.431.075	3,915,983	4,570,887	9.291,081
Generators, d.c.	20 582,498	28,715,268	1,110,432	3,604,304
Ditto, a.c. ...	20,080,909	28,012,130	27,869,039	27,988,662
Porcelain insulators	3,688,254	4,832,924	338.460	441,387
Glass insulators	445,035	1,311,686	37,834	74,505
Arc lamps ...	125,774	57,755	—	9,682
Incandescent lamps	33,504,773	42,558,104	2,939,287	1,752,993
Static transformers	5,813,277	9,657.692	1,474 702	2,903,131
Insulating tubes	42.645	70,170	119,583	230,190
Totals Lire	240,547,196	309,120,868	72,464.418	97 032,099
£	2,597,690	3,338,215	782,330	1,047,860

Catalogues Wanted.

Messrs. TELEPHONES & ACCESSORIES, LTD., of 58, Upper Thames Street, E.C.4, and other addresses, ask for manufacturers' latest catalogues in their line. The directors of the company are Mr. H. R. Rouse, who was managing director of the International Telephone & Electric Co., Ltd., Mr. A. E. Eats, who was for many years London director of Messrs. Gent & Co., Ltd., and Mr. P. F. Rouse.

Book Notices.

"Notes on the Construction, Operation and Maintenance of Miners' Electric Safety Lamps." Pp. 99, 41 figs. Barnsley: Ceag, Ltd.—Although this book contains information which relates directly to the company's own lamp, there is, in addition, much interesting matter on the subject generally. A chapter is devoted to the subject of candle-power measurement, and is illustrated with numerous diagrams. There is also information on such things as the calculation of the capacity of an accumulator; the lay-out and organisation of the lamp-room; and the testing of electric safety lamps.

"Willing's Press Guide, 1928." Pp. xii+514. London: Willing Service, 356-364, Gray's Inn Road, W.C.1. Price 2s. 6d.—The fifty-fifth annual issue of this comprehensive Index and Handbook of the Press of Great Britain and the Irish Free State is the first of a new and improved series. The mass of detailed information has been revised and brought up-to-date, and every effort has been made to make the Guide a thoroughly reliable work of ready reference.

"The *Electrician* Annual Tables of Electricity Undertakings, 1928." (Pp. vii+202.) London: Ernest Benn, Ltd. Price 10s. net.—The 1928 edition has been completely revised, and particulars of many new undertakings, together with projected schemes, have been included.

"Pitman's Technical Dictionary in Seven Languages." Compiled by Ernest Slater, M.I.E.E., M.I.Mech.E. In 36 fortnightly parts. Parts I and 2. London: Sir Isaac Pitman and Sons, Ltd. Price 2s. 6d. net each part.

"The Instrument World," a trade and technical journal for designers, makers, and users of scientific instruments. Part I, Vol. I. May, 1928. London: The Hatton Press. Price 6d.

The German Electrical Industry.

The *Deutsche Bergwerks Zeitung* says that in the first three months of this year the German electrical industry was satisfactorily employed on home orders; the upward trend in the receipt of orders, however, has been checked somewhat during the last few weeks. The mining concerns have given most orders, as these concerns are obliged to mechanise their plant to the utmost and are turning to electrical equipment as the best means of doing so. The electricity works have also given numerous orders. Orders from the Post Office have decreased, but those from the State Railways for the purpose of carrying out their electrification programme are described as satisfactory. The orders given by the State Railways for safety appliances have fallen off.—*Reuter's Trade Service* (Dusseldorf).

Merchandise Marks Inquiries.

The *Board of Trade Journal* publishes a list of goods in connection with which inquiries are to be held under the Merchandise Marks Act, 1926, to decide whether they should be marked with the name of country of origin upon importation or sale. The list includes rubber manufactures (unspecified); copper plates, sheets, strips, sections, rods, wire and tubes; ball and roller bearings and parts; pumps of all descriptions and parts; and vacuum cleaners. Communications regarding these inquiries should be addressed to the secretary of the Standing Committee, Mr. E. W. Reardon, Board of Trade Offices, Great George Street, S.W.1.

For Sale.

Messrs. J. W. Akroyd & Son will sell by auction on May 15th, at Dale Street and Piccadilly, Bradford, a large stock of electrical goods, cables, &c. Wolverhampton Corporation Electricity Department has for disposal several generator sets, surface condenser pumps, &c. East Ashford Board of Guardians has for disposal one 3-kW generating plant. (See our advertisement pages to-day.)

Electricity at the Brussels Fair.

A feature of the Belgian Industrial Fair at present being held in Brussels is the display of the Société de l'Union des Exploitations Electriques, a body which represents the whole of the undertakings engaged in electricity generation and distribution in Belgium. Upon the stand are displayed photographs of the various generating stations in the country and a series of diagrams indicating the growth of output. One diagram shows that 90 per cent. of the electricity generated in Belgium is utilised for power purposes, 1 per cent. for public lighting, and 9 per cent. for domestic lighting and other uses. Another diagram indicates that 91 per cent. of the Belgian people living in small towns and villages have now a supply of electric power available. Yet another diagram shows that whereas the cost of living in Belgium is now eight times that ruling before the war, electricity is only 3.9 per cent. dearer, while another illustrates the fact that the length of distribution mains has doubled during the past five years.

South African Tariff Reductions.

The *Board of Trade Journal* notes that the rates of import duty on certain articles imported into the Union of South Africa are about to be reduced. Among the goods affected are "electric irons and steam-electric irons for industrial purposes" (minimum, free; maximum, 3 per cent.), and "mechanical filters for use in connection with electric power stations and industrial machinery" (free).

Recent Contracts.

As was stated at the English Electric Company's annual meeting last week, the POWER AND TRACTION FINANCE Co. has secured a contract for the financing, supply and erection of a large power station in Hungary, together with the work of electrifying part of the Hungarian State Railways. Orders for machinery and plant have been placed with the ENGLISH ELECTRIC CO., LTD., BABCOCK & WILCOX, LTD., CALLENDER'S CABLE & CONSTRUCTION CO., LTD., and GANZ, of Budapest. Loans of over £3,000,000 are being raised in this country to finance the work; part of the capital and interest will be guaranteed under the Trade Facilities Acts.

In our "City Notes" will be found a reference to debenture issues of the Hungarian Trans-Danubian Electrical Co., Ltd., which has been formed to carry out the work.

Prices of Raw Materials.

Messrs. James Forster & Co. reported on May 5th that the lead market improved during the week, prices advancing 5s. per ton all round. On May 4th the tone was easier again at a decline of 3s. 9d. per ton. "After the flurry caused last week by Russian buying, the market has relapsed this week into its former apathetic state. A fair business has been passing with consumers, but there is no evidence of any increase in demand. Arrivals are moderate."

Messrs. F. Smith & Co. and Messrs. James & Shakespeare report, May 8th:—No change in copper and lead prices.

Messrs. Edward Till & Co. report, May 8th:—India-rubber, Para fine, 10¼d., ¼d. inc.

Lighting and Power Notes.

Argentina. — ELECTRICAL DEVELOPMENT. — The Compania Hispano-Americana de Electricidad (Chade) reports that during 1927 the output of the power stations controlled by the company in Buenos Aires reached a total of 588,595,570 kWh, an increase of 54,593,040 kWh as compared with 1926. At the end of the year the number of consumers totalled 255,241, representing a load of 684,322 kW, an increase of 25,575 and 60,040 kW respectively during the twelve months. The length of mains increased to 4,925 miles. Steady progress is being made with the extension of the main Dock station, where a new 25,000-kW turbo-generator and a 42,500-kW set were put

in operation last year. A second 42,500-kW set is at present in course of erection, and is expected to be ready for operation before next winter. At Avellaneda the number of consumers increased during the past year from 21,444 to 24,897, and the load from 31,754 to 38,894 kW. The sales during 1927 amounted to 37,887,968 kWh, as against 33,566,647 kWh in the preceding year.

Australia.—YALLOURN (VIC.).—According to the *Electrical Engineer of Australia and New Zealand*, the State Electricity Commission of Victoria is calling for tenders, returnable in September, for 135,000-V switchgear for extensions at the Yallourn power station, and for 120,000-V switchgear for the Richmond terminal station. No official statement has been made, but it is evidently the intention to install additional generating plant at Yallourn, with a capacity of 50,000 kW, erect a duplicate 132,000-V two-circuit transmission line to Melbourne, and construct a new terminal station at Richmond. When the Yallourn power station was first laid down, provision was made for future duplication of the station and transmission line. The tentative plans showed a second boiler house, lying parallel with the first, and extensions on the present engine room and switchyard. The probability is that two 25,000-kW generating units will be installed in preference to 12,500-kW sets as now operating. This will bring the effective rating of the station up to 100,000 kW, the capacity for which it was laid out. Even when this plant is in operation the site will still permit of the installation of a further 50,000 kW. The Richmond terminal station will function similarly to that at Yarraville, controlling and regulating the energy coming in over the new line from Yallourn, and will link in with the existing primary distribution system served by the Yarraville station.

Bexhill.—LOANS SANCTIONED.—The Corporation Electricity Committee has received sanction to the borrowing of £12,759 for mains, and £5,381 for converting plant and switchgear.

Birkenhead.—ELECTRICITY IN BULK.—At a recent meeting of the Corporation Electricity Committee, the town clerk reported upon a recent conference between representatives of the Committee and the Electricity Committee of the Wallasey Corporation regarding an increased supply of electricity in bulk to Birkenhead. The Committee has recommended that the offer of the Wallasey Corporation be accepted. The Committee has further considered the terms of the provisional offer made by it for the supply of electricity in bulk to the Hoylake and West Kirby Urban District Council, and has recommended the Council to approve the terms.

Birmingham. — ELECTRICITY SUPPLY.—The Birmingham, Tame and Rea District Drainage Board has approved proposals to lay a cable from Saltley sewage works to Minworth, sufficient in size to allow of normal extensions during the next 20 years—the overhead portion of the existing line which passes over land other than the Board's property being taken down and an underground cable substituted. The estimated cost of cable, overhead line and switchgear, and of the necessary erection work is £21,500.

Blackpool.—LOAN SANCTIONED.—The Corporation has received sanction to borrow £2,000 for transformers and switchgear.

Burnley.—NEW SUB-STATION.—To improve the electricity service in Padiham Road district, the Corporation proposes to erect a sub-station in Whittlefield at a cost of £4,000.

Canada.—TIDAL POWER SCHEME.—The New Brunswick Legislature has passed a Bill giving consent to a project for the development of tidal power in Passamaquoddy Bay, an inlet from the Bay of Fundy. The project is one involving a large number of interests, and is international in character, as Passamaquoddy Bay is on the boundary line between the Province of New Brunswick and the State of Maine. In the Passamaquoddy Bay the rise and fall of the tide is within the range of 28 ft., and the scheme proposed by Mr. Dexter P. Cooper, a New York engineer, contemplates the construction of dams and the bridging of various islands. The estimated cost of the development is likely to be between $50,000,000 and $75,000,000, and the power produced would ultimately reach 700,000 or 800,000 h.p., starting with an initial development of from 400,000 to 500,000 h.p. The construction of the works would occupy some 42 months. The apportionment of power as between the Province of New Brunswick in Canada and the State of Maine in the United States will have to be decided by the International Joint Waterways Commission.

Castletown (Isle of Man).—ELECTRICITY SCHEME.—At a meeting of the Town Commissioners on April 25th a communication was received from Mr. John J. Clague with reference to an electric lighting scheme for the town, and enclosing a plan of the proposed generating station and the cable route. Permission was asked to open the roads and footpaths for the laying of cables. The matter was referred to the Lighting Committee for consideration and report.

Chesterfield.—LOAN SANCTIONED.—The Electricity Committee has received sanction to a loan of £6,688 for transformers, switchgear, and induction regulators.

Continental.—FRANCE.—Work on a new hydro-electric power station at Pinet for the Société de l'Energie Electrique de Rouergue is well in hand and the installation of five 10,000-kVA turbo-generators is about to be commenced. A transmission line has been completed between Tournadous and Madieres and a 60,000-V line between Thuriez and Viviez. The company has applied for a concession to establish a 60,000-V line between Thuries and Lentin, to give a connection with the Midi railway system.

BULGARIA.—A new central station at Kourilo has recently been completed and put in operation by the Société d'Electricite de Sofia et de Bulgarie. Two sets of turbo-generators are installed, but the demand is increasing so rapidly that it has already been decided to install a third set with a capacity of 6,400 kW.

Croydon.—LOANS SANCTIONED.—The Electricity Commissioners have sanctioned the borrowing of the following loans by the Corporation:—Artesian wells, £1,108; pump house and plant, £1,565; grit arrestors, £3,145; cooling towers, £5,509.

Glasgow.—PROGRESS DURING MARCH.—Under the Corporation Electricity Department's scheme, 400 houses were wired in March, making the total to date 7,376. Applications for hire of appliances in March numbered 300, making the total to date 19,202.

Hastings.—ELECTRICITY SUPPLY.—The Corporation Electricity Department has completed the laying of cables at Battle, Rye, and Winchelsea, and will commence to supply electricity within the next few months at the following charges:—General lighting: First 4,000 kWh in any one year, 8d. per kWh; subsequent electricity in any one year, 7d. per kWh. General lighting with slot meters: 9d. per kWh. Rental wiring with slot meter, 11d. per kWh. Exterior lighting, upon three years' agreement: 6½d. per kWh. Arc or high c.p. lighting for photographic purposes (professional): 4½d. per kWh. Cinema arc lighting: 3d. per kWh. Heating: 1½d. per kWh. Power: 1½d. per kWh. Cooking: 1½d. per kWh. Meter rents: 5s. per annum if account does not exceed £3 per annum. Also 5s. per annum for check meters.

Hull.—EXTENSION OF SUPPLY.—The borough electrical engineer has now completed the preparation of the scheme for the supply of electricity in the scheduled portion of the proposed new area and has submitted plans and details. The estimated total cost of the distributing works amounts to £87,030, made up as follows:—Urban district of Cottingham, £18,110; borough of Beverley, £23,603; remainder of area (borough of Hedon and rural districts), £45,317.

India.—CALCUTTA.—According to *Indian Engineering*, the Calcutta Electric Supply Corporation has put into operation the largest sub-station in India at a cost of £110,000. Another scheme which will cost Rs. 5 lakhs has just been undertaken to meet the ever-growing electrical demands. The new sub-station of this Corporation is a sequel to the development of Central Avenue and the Burra Bazar area, and will relieve the load upon the sub-station supplying the city areas. The building has been designed for seven 2,500-kW motor convertors, and at present the installation consists of three 1,000-kW sets, and one 2,500-kW set is in course of construction. The supply to this sub-station is received both from the Cossipore generating station and the southern station at 6,000 V, 3-phase, and is converted to 450 V d.c. for supply to the various consumers. When the new mains are laid, this Corporation will have approximately 1,000 miles of underground cable serving 40,000 consumers.

Irish Free State.—DOWNPATRICK (CO. DOWN).—The Urban District Council has adopted a scheme for the installation of electric lighting in the town at an estimated cost of £6,100.

Leeds.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £20,000 for assisted wiring.

Leyton.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £8,780 for mains, and £12,040 for plant and building work at the power station.

London.—SOUTHWARK.—The borough electrical engineer reports that renewals and reconstruction work are essential to meet next winter's demand, which, in his opinion, is likely to exceed that of last year, and to meet the increasing demands upon the plant, if only as a temporary expedient, until the supply in bulk materialises. The Electricity Committee has recommended an estimate of £5,057 for the purpose.

The Committee has also voted estimates on new mains and services during the financial year amounting to £4,066 and £2,140.

BECONTREE.—The London County Council reports that after protracted negotiation with a view to obtaining the installation of electricity for lighting in new houses at Becontree on satisfactory terms, it has obtained and accepted offers from the County of London Electric Supply Co., Ltd., to install electricity for lighting in 1,000 houses on the estate free of cost to the Council.

New Zealand.—ELECTRICAL DEVELOPMENT.—The *Electrical Engineer of Australia and New Zealand* reports that at the conference of secretaries of power supply authorities, held recently at Wellington, Mr. Charles Campbell stated that electricity is now available to more than 90 per cent. of the population of the Dominion. There are 48 public electric power stations in New Zealand, 100 electricity distributing authorities, and 15,000 route miles of distribution lines. The total investment in generating and distribution systems is £19,000,000, and that in the wiring of consumers' premises £4,600,000.

The Government has decided to proceed immediately with the construction of a new hydro-electric station on the Waitaki River in Canterbury at a cost of £1,200,000, with a capacity

of 150,000 h.p., equal to that of the Government station at Arapuni.—*Reuter* (Wellington, N.Z.).

Oldham.—ELECTRICITY IN SMALL HOUSES.—The Corporation Electricity Committee has decided that arrangements be made in suitable cases for the installation of pre-payment meters in the houses erected at Greenacres and Barrowshaw for the accommodation of the tenants displaced by the Smethurst Street Improvement Scheme, and that the inclusive charge for the supply of electricity in such cases be 4½d. per kWh (flat rate).

Rotherham.—LOAN.—The Corporation Electricity Committee has recommended that application be made for sanction to a loan of £40,000, the estimated cost during the next three years of installations and meters in connection with the assisted wiring scheme.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee has authorised mains extensions at a cost of £12,000.

Shipley.—EXTENSION OF SUPPLY.—In connection with the supply of electricity to new property at Cottingley Cliffe the Urban District Council Electricity Committee has decided to extend cables and provide a sub-station at an estimated cost of £1,190.

Sleaford.—ELECTRICITY SUPPLY.—At a recent meeting of the Urban District Council Electricity Committee, the electrical engineer submitted estimates of cost of a new engine set, as suggested by the Electricity Commissioners, including the cost of fuel, wages, and other working expenses, over a period of 11 years, and the cost of replating and repairing the existing battery with maintenance, &c., for the same period, *viz.*: Engine set, £3,998; battery, £2,741. The engine set would cost £1,257 more than the battery and the engineer therefore recommended the retention of the battery. It was decided to inform the Commissioners that the Committee was of opinion that the repair of the battery would be the cheapest as well as the safest proposal.

Southport.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £49,704 for mains, services, kiosks, and transformers, and £14,000 for a water-tube boiler and auxiliary equipment.

South Shields.—SUPPLY TO LIGHTHOUSES.—Representatives of the River Tyne Commissioners have interviewed officials of the Corporation with regard to certain proposals of the Commission to substitute electricity for the present gas illuminant at the lighthouses on the South Pier and the Groyne. The proposals, which include the installation in the pier lighthouse of a new fog signal to be operated by electricity, in place of the existing fog bell, are the outcome of the consideration which has for some time past been given to lights and other aids to navigation provided by and under the jurisdiction of the Commissioners and form part of a larger scheme, the main objects of which are to improve lights and navigation aids. A report was received from the borough engineer, and the Parks Committee resolved that the Commissioners should be informed that the erection of the poles would cause an unsightly obstruction to the foreshore, but the Committee would be disposed favourably to consider the scheme if all the cables were laid underground.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the Sevenoaks and District Electricity Co., Ltd., authorising it to supply electricity to certain parishes in the rural district of Godstone, and empowering the Horley & District Electricity Supply Co., Ltd., to give a supply of electricity in bulk to the company; York Corporation to extend its area of electricity supply so as to include parts of the rural districts of Escrick, Pocklington, Easingwold, Flaxton, Matton, and Great Ouseburn; and the South Somerset and District Electricity Co., Ltd., to supply electricity in part of the rural district of Axminster.

Stone (Staffs.).—LOAN SANCTIONED.—The Urban District Council has received sanction to a loan of £12,000 for electricity purposes.

West Ham.—NEW PLANT.—The Town Council has applied for sanction to a loan of £233,296 for the installation of additional plant at the electricity works, including a 30,000-kW turbo-alternator, condensing plant, two water-tube boilers, stokers, economisers, air heaters, two cooling towers, switchgear, pipework, &c.

York.—EXTENSION OF SUPPLY.—In connection with the proposed application for a Special Order authorising the extension of the Corporation area of electricity supply, the Electricity Committee has approved a report by the city electrical engineer outlining a scheme for the construction of transmission lines through Linton-on-Ouse *via* Tollerton, Alne, Easingwold, Stillington and Farlington, from the existing supply at New Earswick to the villages of Stillington and Sutton-on-Forest, and from the existing supply at Strensall to the village of Sheriff Hutton *via* Flaxton. It is not proposed that the whole of the scheme should be carried out at once, but it is proposed to undertake to provide, within two years, a transmission line from Linton to Tollerton and Alne. The estimated capital expenditure of this extension and also the main transmission line to Easingwold and l.p. distribution in the villages of Tollerton and Alne is £8,237. The line will be of sufficient capacity to admit of an extension of lines to other villages, and ultimately the lines would act as a duplicate connection between York and the Linton power station.

Tramway and Railway Notes.

Bradford.—YEAR'S WORKING.—The accounts of the Corporation Tramways Department to March 31st last show that there was an increased income from 'buses of £37,000, from railless cars of £17,000, and from trams of more than £10,000.

ABANDONMENT OF TRACK.—The Corporation Tramways Committee decided on May 4th to abandon the permanent way from Undercliffe to Greengates and substitute motor-'bus services for the present tramway. Road improvements would involve a prospective cost of £7,899 in moving the tramway to another part of the road, and it was estimated that in four years' time the whole of the Greengates track would require renewal at a cost of £36,528.

Continental.—ITALY.—In connection with the electrification of the North Milan railway a contract has been placed with the Compania Generale di Elettricita, of Milan, for four 1,000-kW electric locomotives. The engines will have four motor-driven axles and are intended for operation at 3,000 V c.c.

FRANCE.—Following tests of four different types of electric locomotives, the Paris, Lyons and Mediterranean Railway Co. has placed a contract with the French branch of the Oerlikon Maschinenfabrik for the electrical equipment of four 5,400-h.p. electric locomotives.

DENMARK.—According to the returns lately issued for the financial year 1926-27, the municipal electric tramway system in Copenhagen comprises 63 miles of track, 426 motor tramcars, and 430 trailers. The total number of passengers carried during the twelve months was 141 millions and the consumption of electricity amounted to 16 million kWh.

London.—L.C.C. TRAMWAY ESTIMATES.—The Highways Committee of the L.C.C. has submitted a report on the annual estimates in respect of the tramway undertaking for the year 1928-29. The estimated total revenue is £4,335,400, and working expenditure £3,716,410, leaving a gross profit of £618,990. After payment of debt, and interest on debt, the estimated net deficiency is £103,529. The amount to be voted on capital account is £292,180, the principal items being expenditure on new plant at Greenwich power station, improvement of cars, and permanent-way works. In addition, a provisional sum of £148,250 has been included in the estimates to cover expenditure which may be incurred on the enlargement of the tramway subway from Victoria Embankment to Southampton Row, and the improvement of a further number of cars, making a total estimate of £440,430. The improvement of cars by the provision of transverse and cushioned seating, better lighting, &c., is being rapidly proceeded with, and at March 31st last 351 such cars were in service. An additional 500 cars will be similarly equipped during 1928-29.

"ALL-DAY" TICKETS EXTENSION.—The area covered by the shilling "all-day" tickets issued on the L.C.C. tramway system was extended on May 1st so as to include the whole of Hammersmith. The ticket is also available on the London United Tramways cars. There are now 205 miles of route over which this ticket is available.

Manchester.—PROPOSED UNDERGROUND RAILWAY.—The Manchester correspondent of *The Times* states that Mr. H. Mattinson, general manager and chief engineer of the Corporation tramways, has submitted an underground railway scheme for joint discussion between his committee and the Corporation Underground Railway Special Committee. Mr. Mattinson proceeds on lines quite different from those followed in a scheme issued by the Underground Railway Special Committee a few weeks ago. He has evolved a plan for linking up all the existing railway, tramway, and omnibus routes by means of two short lengths of underground railway, crossing at a proposed central underground station. From there it is suggested that nine suburban routes operating 27 separate services could be reached. The central station for this system would be situated below Albert Square, and at that point an underground railway about three miles in length, running roughly east and west, would intersect with another line four miles in length, running from south-west to north-east. The four main line railway stations in Manchester would be conveniently reached from underground stations on the one or the other of these two lines, and the underground lines would extend to the surface beyond the main line railway stations, where there would be continuous connection at points with existing suburban railway lines, and immediate access to tramway and omnibus ranks. Mr. Mattinson suggests that the Corporation should construct the two underground lines, and then lease them to the railway companies, at the same time arranging with the railway companies to electrify their suburban lines from an outward distance to be agreed upon, and to work these lines in conjunction with the electrified underground lines. The tramway and omnibus systems would be adjusted to fit in with the operation of the electrified suburban lines. The report states that the traffic already available on the suburban railway routes serving Manchester averages 200,000 persons daily in and out of the four main stations, a number sufficient to ensure an immediate and adequate return on the relatively small length of underground railway.

Telegraph and Telephone Notes.

International Telephony.—GENEVA-LAPLAND.—Conversation was made possible on April 28th between Geneva (Switzerland) and Kiruna, in Upper Lapland (Sweden), 100 miles north of the Arctic Circle. The new telephone circuit, consisting of 2,530 miles of double wire, includes 1,125 miles of underground cable between Geneva and the Baltic coast at Stralsund, 100 miles of submarine cable between Stralsund and Malmö, and 1,305 miles of overhead wire between Malmö and Kiruna.

Irish Free State.—TELEGRAPH SERVICE.—In Dail Eireann on April 25th, the Minister for Finance stated in his Budget statement that at the present time the maintenance of the telegraph service involved a substantial annual loss, and there was no prospect of its becoming self-supporting. On the contrary, as telephony came into more general use, telegraphy would decline. To a certain extent falling traffic would make possible reductions of staff, but on the whole the tendency would be for the difference between income and expenditure to widen. The service must be retained, and the only way of reducing the deficit, and preventing the burden on the Exchequer from growing, was by increasing the tariff. They proposed to raise the minimum rate for ordinary telegrams to 1s. 6d. each, but even then each message sent would still involve a contribution of about 6d. for the Exchequer. The loss to the Post Office at present, after allowance was made for services rendered by it to the other Government departments, was about £400,000 per annum. A great proportion of the telegrams handed in were of a sporting nature, and not such as could very strongly claim a contribution from the ordinary taxpayer towards the cost of their transmission, and the increase proposed was not likely to affect appreciably the course of business in the country. It would produce £66,000 this year and £70,000 in a full year.

Switzerland.—LEAGUE OF NATIONS STATION.—The proposal to erect a radio-telegraph station for the League of Nations at Geneva at an estimated cost of £50,000, with working expenses of £8,000 a year, will be considered by the Council and the Assembly of the League in September next. The estimate is contained in a report of a small committee of experts, on which Great Britain was represented by Lieut.-Colonel A. G. Lee, of the General Post Office. The committee believes that at least 1,200,000 words would be distributed annually from the station. The annual receipts during the first few years are estimated at between £4,000 and £5,000.

Radio Notes.

Canada.—LICENCES CANCELLED.—Two Toronto stations will not be heard again, the Radio Branch, Department of Marine and Fisheries, having informed CJYC and its "phantom" CKCX that their licences would not be renewed during 1928-29. CJYC, the Universal Radio Company, leased its time to CKCX, the International Bible Students' Association, whose programmes were objected to by listeners, thus causing the Department to cancel all their licences from coast to coast. Their stations in Edmonton, Saskatoon, and Burnaby, B.C., will not be "on the air" this year, unless political action is taken in their favour, says *World-Radio*, which explains that the cancellation resulted in a general re-allocation of wave-lengths. CFCA, the pioneer station of the Dominion, remains on its original wave-length of 356.9 metres; CNRT and CKOW, two "phantoms," will use station CFCA; CKCL and CKNC will occupy the 516.9-metre band, sharing time, and CHIC, a phantom of CKNC, will also be found on that wave-length; CKGW, the recently-opened 5-kW station, will share time with CFRB on 312.3 metres. Toronto was added to the eastern chain of stations operated by the Radio Department of the Canadian National Railways on May 1st, so that the chain now includes CNRQ, CNRM, CNRO, and CNRT—Quebec, Montreal, Ottawa, and Toronto respectively.

Germany.—LICENCES.—In Germany there are 248,198 fewer subscribers to the broadcasting service than in England, the respective totals at the end of March, 1928, being 2,482,930 in England and 2,234,732 in Germany; Germany's increase since March, 1927, was 599,004.

NEW RELAY STATION.—The completion of the relay station at Flensburg will increase the number of broadcasting stations in Germany to a total of 25.

Hungary.—LICENCES.—H.M. Commercial Secretary at Budapest informs the Department of Overseas Trade that the development of wireless in Hungary proceeded during 1927, although not very rapidly. The new station (which commenced operation on April 29th) is expected to result in a considerable increase in the use of crystal receivers. At present about half the sets in use in Budapest are crystal receivers, whilst the remainder and practically all sets in use in the provinces are of the valve type. At the end of 1927 the number of receivers used in the country districts was 38,004 and in all towns 45,310, representing 54.5 sets per 10,000 inhabitants in country districts and 287.8 sets per 10,000 inhabitants in towns, the highest figures being for Budapest (40,408 instruments, 435.6 sets per 10,000 inhabitants.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Argentina.—BUENOS AIRES.—June 8th. Department of Sanitary Works for the Nation. Two groups of electrical sewage pumps for the Military College and Aviation Camp. (A. 6186.)*

Australia.—MELBOURNE.—September 3rd. State Electricity Commission of Victoria. 120,000-V switchgear for Richmond terminal station; 135,000-V switchgear for Yallourn power station extension. (April 20th.)

June 25th. 2,000, or alternatively, 12,000 tensioning and suspension disk-type insulators. (B.X. 4382.)*

June 12th Postmaster-General's Department. Resistances and reactances. (B.X. 4359.)* Loading coil pots complete with coils. (B.X. 4400.)*

SYDNEY.—August 29th. N.S.W. Government Railways. Two 20,000-kW turbo-alternators and condensing plant for Ultimo power house. (B.X. 4402.)*

Belfast.—May 19th. Electricity Department. One 1,000-kW rotary-convertor, with transformer, l.p. a.c. switchgear, one 500-kW ditto. (May 4th.)

Birmingham.—May 16th. Birmingham Tame and Rea District Drainage Board. 5½ miles e.h.p. cable. (April 27th.)

Bulgaria.—TROYON.—May 30th. Water Syndicate. Pipe lines, water turbines, generators, switchgear and accessories. (B.X. 4378.)*

Bury. — May 19th. Electricity Department. E.h.p. switchgear, &c. (See this issue.)

Colchester.—May 30th. Electricity Committee. One 250-kVA transformer, one e.h.p. switch cubicle, four l.p. oil circuit breakers, &c., 5,450 yd. l.p. cables, &c. (May 4th.)

Dundee.—May 22nd. —Tramways and Motors Department. Stores for 12 months. Specifications, &c., from Mr. D. P. Morrison, general manager.

East Lothian.—May 19th. Education Authority. Electrical work at Ormiston Public School. Schedules, &c., from Morham & Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Egypt.—CAIRO.—June 16th. Ministry of the Interior. One 300-h.p. Diesel engine, direct coupled to a 250-kVA alternator, for the Damanhour power station extension. (B.X. 4349.)*

Edinburgh.—May 21st. Corporation. Electric lighting installation for the new town hall and library at Leith. Particulars from Bradshaw, Gass & Hope, architects, Polton.

The Corporation is inviting tenders for 12 electrical and mechanical equipment for new tramcars.

Glasgow.—May 17th. Electricity Department. Twelve months' supply of l.p. cables, small i.r. insulated cables and flexibles, meters, carbons, &c. (May 4th.)

Hull.—May 17th. Electricity Committee. Cable conduits, &c. Mr. H. Bell, city electrical engineer, Sculcoates, Hull. (Deposit £1 1s.)

India.—May 18th. India Stores Department. 6,500 2, 3, 4 and 6-conductor telephone cords. (May 4th.)

Knottingley.—June 4th. U.D.C. Four electrically-driven vertical turbine pumps for sewage works. Specification, &c., from Mr. C. R. J. Connor, Town Hall.

London.—H.M. COMMISSIONERS OF WORKS.—May 14th. Incandescent electric lamps. May 15th. Fuseboards and switches. (May 4th.)

Manchester.—May 16th. Electricity Committee. 33,000-V and 6,600-V switchgear, also switch-operating batteries and charging gear. (April 27th.)

Board of Guardians. Lifts and electric lighting installation at nurses' home, Crumpsall Infirmary. Specification from Mr. A. J. Murgatroyd, architect, 23, Strutt Street, Manchester.

New Zealand.—WELLINGTON.—July 10th. Public Works Department. 50-kV switchgear and steelwork for Arapuni power scheme. (B.X. 4410.)*

Ripon.—May 19th. Electricity Department. E.h.p. and l.p. cables, boxes, roadwork and public lighting. (April 20th.)

Rochdale.—May 22nd. Town Council. Electric lighting and power installation for 388 houses, Nook estate. Particulars from Borough Surveyor, Town Hall.

Southampton.—May 29th. Electricity Committee. One 15,000-kW turbo-alternator set, with condensing plant, 2,000-kW rotary-convertor set, with transformer, starting panel, e.h.p. switch cubicles, control panels, boiler feed, &c. (April 27th.)

South Africa.—PRETORIA.—May 31st. Department of Posts and Telegraphs. Outdoor distribution boxes for 15-pair telephone cable and magneto and central battery switchboards. (B.X. 4324.)*

June 7th. Telephone cable, copper wire, &c. (B.X. 4335.)*

JOHANNESBURG.—May 25th. Municipal Council. 6,600- and 3,300-V switchgear, with cables, signalling and telephone apparatus, and power and lighting transformers. (B.X. 4371.)*

May 26th. H.p. cable (B.X. 4415.)*

June 21st. Eighteen sets of traffic control signals. (B.X. 4418.)*

DURBAN.—June 1st. Corporation. One 100-kVA 3-phase transformer. (B.X. 4395.)*

West Riding.—May 15th. Installation of electric lighting at Bramley and Wickersley new school. Education Department, County Hall, Wakefield.

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—MELBOURNE.—State Electricity Commission of Victoria.

Aluminium steel-cored cable and accessories.—British Insulated Cables, Ltd.

Commonwealth Department of Works and Railways.

Four electric elevators at Commonwealth Bank, Brisbane (£17,803).—Waygood-Otis (Aust.) Pty., Ltd.

SYDNEY.—New South Wales Railways.

200 trailer-car bogies (£45,390).—Ritchie Bros.

10 mercury-arc rectifier units (£87,336).—Gibson, Battle and Co., Ltd.

Municipal Council City Commissioners.

Storage-battery regulating switches, &c., at the Clarence Street sub-station (£76,119).—Tudor Accumulator Co., Ltd.

Machinery for sub-station (£5,748).—Noyes Bros. (Sydney), Ltd.

Switches, &c. (£3,125).—Metropolitan Vickers Electrical Co., Ltd. —*Tenders.*

Ayrshire.—Education Committee. Accepted:—

Electrical work at Ayr Clinic (£96), and Annbank School extensions (£108).—Potter & Co.

Birkenhead.—Electricity Committee. Accepted:—

Two 1,000-kW convertors and one 500-kW ditto (£10,099).—Metropolitan-Vickers Electrical Co., Ltd.

Two 200-kVA indoor type transformers (£270).—Brush Electrical Engineering Co., Ltd. One 200-kVA outdoor type ditto and two 100-kVA indoor type ditto (£320).—English Electric Co., Ltd.

Three h.p. feeder cubicles, two h.p. rotary cubicles, one l.p. rotary panel, and nine l.p. d.c. feeder panels (£1,963).—British Thomson-Houston Co., Ltd.

One h.t. rotary cubicle, one l.p. rotary panel, and one h.p. feeder cubicle (£577).—Ferguson, Pailin, Ltd.

One h.p. transformer cubicle and one l.p. transformer ditto (£187).—General Electric Co., Ltd.

33,000-V trunk main from Wallasey power station to Bentinck station (£15,551).—W. T. Henley's Telegraph Works Co., Ltd.

E.h.p. 6,600-V split conductor feeder from Bentinck Street station to Singleton Avenue station (£3,163).—W. T. Glover & Co., Ltd.

Cable (£1,452).—Macintosh Cable Co., Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—

Supply and laying cable to Newhall (£5,356).—Johnson and Phillips, Ltd.

Bradford.—Tramways Committee.

Ashes elevator, Thornbury car depôt (£220).—Drakes, Ltd.

Tramcar gear wheels (£147).—British Hele Shaw Patent Clutch Co., Ltd. Rewinding 30 tramcar motors (£2,700).—English Electric Co., Ltd.

Electricity Committee.

Cooling stacks in No. 8 cooling tower, Valley Road power station.—Davenport Engineering Co., Ltd.

Grimsby.—Electricity Committee. Recommended:—

Burners for converting boiler for oil fuel firing (£104).—Swinney Bros., Ltd.

Hull.—Telephones Committee. Accepted:—

Automatic table telephones and bell sets (£402).—Peel-Conner Telephone Works.

Cable (£399).—Ateliers de Constructions Electriques de Charleroi.

Leeds.—Electricity Committee. Accepted:—

Annual supplies:—

L.r.-covered cables, mains boxes, fittings, &c.—Leedham and Heaton; Macintosh Cable Co.; General Electric Co.; E.G.S. Co.; Ioco Rubber Waterproofing Co.; Metallic Seamless Tube Co.; Sykes & Dyson; W. T. Henley's Telegraph Works Co.; India Rubber, Gutta Percha, &c., Co.; Armorduct Cable Co.; Hamnett and Andrew; Yorkshire Switchgear and Engineering Co.; Wm. Geipel; Edison Swan Electric Co.; John Russell & Co.; and Mersey Cable Works.

Cable (£4,424), W. T. Henley's Telegraph Works Co., Ltd.; (£8,938), Macintosh Cable Co., Ltd., and (£5,696), Enfield Cable Works, Ltd.

Parks Committee. Accepted:—

Set of batteries for electric launch (£70).—R. F. Winder, Ltd.

London. — STEPNEY.— Electricity Supply Committee. Accepted:—

4,166 house service fuse boxes (£594).—W. T. Henley's Telegraph Works Co., Ltd.

LONDON COUNTY COUNCIL.—Housing Committee. Accepted:

Electric light installation at staircases on Wapping estate (£145), at Limehouse buildings (£53), at the Whitmore estate (£53).—Electrical Installations, Ltd.

Luton.—Town Council. Accepted:—

Rotary convertor (£3,400).—Mather & Platt, Ltd.

Transformer (£838).—Hackbridge Electric Construction Co., Ltd.

Plymouth.—Electricity Committee. Accepted:—

Switchgear (£675).—A. Reyrolle & Co., Ltd.

Rotherham.—Electricity Committee. Recommended:—

Twelve months' supply of transformers.—Metropolitan-Vickers Electrical Co., Ltd.

Sheffield.—Markets Committee. Accepted:—

Electric goods lift at abattoir (£2,160).—W. Wadsworth and Sons, Ltd.

Electricity Committee. Accepted:—

Tubes and headers for economiser at Neepsend power station (£1,475).—E. Green & Son, Ltd.

Shipley.—Electricity Committee. Accepted:—

Kiosk and equipment (£326).—English Electric Co., Ltd.

Sleaford.—Electricity Committee. Accepted:—

500 porcelain insulators.—W. T. Henley's Telegraph Works Co., Ltd.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following:—

KLIDOS plugs and sockets for use on ships.

KALOS switches (Pat. Nos. 373/09 and 27,446/09).

We have also received an inquiry for makers of ultra-violet ray apparatus used in the baking of bread.

Arc-welded Motor-cars.

The increasing use of welding in automobile manufacture is demonstrated by the fact that a large number of parts on the new Ford car are constructed by arc welding. These parts include the rear axle housing, the steering gear casing, the radius rod, the spare-tire carrier, the drag link for the front axle and the axle rods. It is said that experiments are now under way preparatory to welding several other parts in addition to those mentioned. In the past few months the Ford Company has installed approximately 30 automatic arc-welding equipments for this work, manufactured by the General Electric Company of America. Although this is considered a fair-sized automatic welding installation, it is but the beginning of the automatic arc-welding operations planned by the automobile company.

Forthcoming Events.

Junior Institution of Engineers.—Friday, May 11th. 39, Victoria Street, S.W. 7.30 p.m. "Notes on the Drying of Industrial Products." Mr. A. T. Henly.

Polytechnic, Regent Street, W.1.—Friday, May 11th. 6.30 p.m. "Relations of Cable and Wireless." Mr. F. J. Brown.

Institution of Welding Engineers.—Tuesday, May 15th. 7.30 p.m. "Standardisation of Welding." Mr. P. L. Roberts.

Institute of Physics.—Tuesday, May 15th. 1, Lowther Gardens, Exhibition Road. 4 p.m. Annual general meeting. Presidential address by Sir Frank Dyson, F.R.S. "Physics in Astronomy."

Batti-Wallahs' Society.—Wednesday, May 16th. Hotel Cecil, Strand, W.C. 1 p.m. Address by Mr. Ll. B. Atkinson on "Electrical Industry—where do we Stand To-day?"

Faraday Society.—Wednesday, May 16th. Burlington House, W. 8 p.m. Annual general meeting. Presidential address, "Diffusion in Solids." Prof. C. H. Desch.

Overhead Lines Association.—Wednesday, May 16th. Institution of Electrical Engineers, Victoria Embankment, W.C. 5.30 p.m. "Standard Overhead Lines: Their Advantages and Number of Different Standards Required." Mr. D. C. Redfern.

Society of Technical Engineers.—Wednesday, May 16th. Engineers' Club, W. 7.30 p.m. "Electricity Undertakings." Mr. G. W. Molle.

British Institute of Radiology incorporated with the Röntgen Society.—Thursday, May 17th. 32, Welbeck Street, W. 8.30 p.m. Annual general meeting.

Institution of Electrical Engineers.—Thursday, May 17th. Institution, London, W.C. 6 p.m. Annual general meeting.

Notes.

New Electric Locomotives.

Two electric locomotives of a new type, which are designed to operate from either a trolley-wire or a storage-battery supply, have been put in service by the Chicago, North Shore and Milwaukee Railroad. Provision is made for the automatic charging of the battery when necessary from the trolley supply. The flexibility of operation enables these locomotives to switch cars into industrial yards, &c., equipped with tracks, but not trolley connections The locomotives were built by the General Electric Company of America. The equipment on each includes four 200-h.p. motors and a 192-cell storage battery capable of delivering 260 kWh on one charge. Operating on the storage battery, one of these locomotives can haul a 1,000-ton train at a speed of from 10 to 12 miles per hour on a tangent level track, or, running light, it will attain a maximum speed of from 30 to 35 miles per hour. A 25-kW motor-generator set is located in the main cab of each locomotive. Its control is automatic by the use of a contact in an ampere-hour meter in the battery circuit. When the battery becomes fully charged this contact automatically causes the motor-generator set to shut down; when the battery becomes about 15 per cent. discharged again, the set is automatically started. If while the motor-generator set is running the locomotive leaves the electrified line, the set will shut down and start again upon the return of trolley power, without attention from the operator. Transfer from the trolley to battery power is effected automatically by means of a relay which actuates the transfer contactors. In order to restore the trolley power, however, it is necessary to move the master controller to the first notch. Each locomotive has a one-hour rating in tractive effort of 22,000 lb. at 14 miles per hour, and a continuous rating of 17,000 lb. at 15 miles per hour, when operating from a 600-volt trolley-wire supply.

Electricity Supply in Sweden.

In the course of an article in *Swedish Export* on the increasing use of electricity in Sweden, the Hon. J. B. Osborn, American Consul-General at Stockholm, states that the water-power administration has requested a Government appropriation of 2,000,000 crowns for the budget year 1928-29, and it is stated that the major part of this fund will be used for an extension of the steam-electric plant at Västeras, which acts as a reserve and peak station for the entire Government power system in central and southern Sweden. Attempts are also being made to arrive at a system of co-operation between the Government stations and the private ones, and the water-power administration is at present negotiating for this purpose with the Lanforsen power station, the capital stock of which is controlled by the city of Stockholm.

The water-power administration introduced a system of rebates on energy for farms in 1923, and since then the consumption of electricity for this purpose has increased 40 per cent. The farmers who use electric current usually form local distributing associations and pay a price of 250 crowns per kilowatt-year. This charge will be reduced to 200 crowns in 1928. Electricity over and above this amount is obtained at the rate of 7 öre per kilowatt-hour during the winter and 3½ öre per kilowatt-hour during the summer; this gives an average price per kWh of 10 öre in 1926, 9½ in 1927, and (estimated) 8½ öre in 1928. The öre equals ¼d. The consumers of rural current at present use an average of 53 kWh per hectare per year (1 hectare equals 2½ acres), which implies an increase of 10 per cent. over the previous year.

One of the aims of the water-power administration is to attain as complete an electrification as is possible on the farms of Sweden. Electric power is used for driving threshing machines and milking machines, on some of the larger farms. Recent experiments with forced cultivation by means of electric heating and illumination seem to point toward a more widespread use of electric power for farming purposes. At present there are 5,000 square metres of electrically heated beds for the cultivation principally of vegetables. The largest establishment of this nature is situated at Hesselby, near Stockholm, and has an area of 1,300 square metres. An extension increasing its area to 2,000 square metres is now being carried out. Electric cultivation as far as 40 miles north of the Arctic Circle has produced a crop of vegetables as early as March 28th. Experiments in heating open fields have given satisfactory results, but the cost of wire and power makes this method too expensive at present for practical use.

Experiments have also been conducted with electricity for airing and drying grain, which seem to indicate a new use for electricity on the farm. Electric cooking is the branch of household electrification that is attracting greatest attention. At present 17 cities in Sweden (principally around Lake Maelar) have reduced rates for electricity used for household purposes, varying between 7 and 9 öre per kWh. Kiruna, near the Porjus power station in the far north of Sweden, has the largest percentage of electrically-equipped houses, 55 per cent. of its population using electricity for cooking. Stocksund, a suburb of Stockholm, takes second place, with 45 to 50 per cent. In the city of Stockholm itself the introduction of electric cooking is slow because of the widespread use of gas.

London and South-East England Electricity Scheme.

It is reported that the Central Electricity Board is about to issue specifications and invite tenders for the main transmission lines in connection with the London and South-Eastern Counties Scheme, involving, with the transforming stations, an expenditure of over seven millions sterling. The overhead lines will have an aggregate length of more than 500 miles.

Installation Engineers' Problems.

Problems relating to electrical wiring installations were referred to by Mr. F. C. Dain in a lecture to the Institution on May 4th, on the subject of "The Application of Electricity to Domestic Purposes." The lecturer said there was little to choose between a simple hire arrangement in which something extra was paid per unit of electricity consumed, and one in which a fixed periodical charge was made based on the number of points installed. Each arrangement had its relative advantages, and it was chiefly a review of local prevailing conditions which was the deciding factor. The advantage of the hire-purchase arrangement from the point of view of the consumer was, of course, that after a certain number of payments the installation became his property. In one particular area, out of 200 installation agreements, about two-thirds were for hire-purchase and one-third for simple hire. Mr. Dain said that he had found it almost impossible to sell opal lamps to working people; they insisted on having a lamp which "did not keep the light in," and were unimpressed by comparative demonstrations. He said that the number of premises in which the hirer was merely the tenant reached a high proportion, but owners rarely refused permission for the installation upon the supply authority's undertaking to make good any damage done in fixing, repairing or removing.

Electricity in Agriculture in France.

According to the *Implement and Machinery Review*, the distribution of electrical energy to farms in mountainous districts has become almost general in France, and at a recent conference at Grenoble it was stated that practically all the communes in the department of the Isère were electrified. The farms are more or less isolated, and as there is little scope for co-operation each farmer must have a complete equipment of machinery, even to small thrashing machines, special types of which are constructed for use in the mountains. In such cases the employment of electrical energy has become indispensable. During the thrashing season the demands for power so far exceed the capacity of the transformers that the distributing companies are obliged to insert clauses in the contracts whereby users can only take a surplus supply in rotation, which means that each farmer is usually allowed two days a week for his thrashing. Electrically operated milking machines are being employed on an increasingly large scale, but nothing has been done in the Department of the Isère with electric ploughing on account of the smallness of the farms. Manufacturers of electric ploughing tackle are demonstrating the value of their plants with so much success that a number of them are now employed in the beetfields and on farms in the northern departments, where there is a particularly complete system of electrical distribution, and the results are declared to be quite satisfactory. The plants are generally owned by co-operative societies.

Electric Canal Haulage.

Among important projects now being discussed in Alsace is one for the improvement of navigation on the canal between the Rhone and the Rhine rivers, especially between Strasburg and Mulhouse. The Chambers of Commerce at Strasburg, Colmar, and Mulhouse at recent meetings agreed to devote large sums in their budgets to the eventual execution of these works. M. Haelling, director of the Port of Strasburg, has drawn up a project for the organisation of electrical haulage on the Rhone-Rhine canal in its Alsatian part. M. Haelling proposes the use of tractors on rails. In conformity with the desires expressed by the Mulhouse Chamber of Commerce, experiments are now being made to find out whether tractors driven by accumulators or by energy collected by trolleys should be used.—*Reuter's Trade Service* (Paris).

Appointments Vacant.

Electrical engineer and tramway manager (£450) for the Aberdare U.D.C. Electricity Department. Commercial assistant for the Borough of Watford Electricity Department. Lecturer in electrical engineering for Loughborough College. Assistant draughtsman (£226) for the Islington Borough Council Electricity Department. (See our advertisement pages today.)

An Electric Welding Job.

In the ELECTRICAL REVIEW of April 1st, 1927, a brief account was given of a repair job to a badly damaged generator casing, which was carried out by electric welding. A somewhat similar repair has recently been done, but this time to an 8,000-kVA turbo-alternator, weighing 12 tons. The cast-iron casing

Fig. 1.—Casing Ready for Welding.

of this machine was fractured in the shop by faulty slinging from a crane, a section of the casing, which is about 6 ft. 7 in. in diameter and approximately 1¼ in. thick, having been forced in by the pressure of the suspension chains. The fracture was prepared for welding, as shown in fig. 1, which also gives some idea of the extent of the damage; the bundle of electrodes is 18 in. long. A new section was prepared and welded in by means of the electric arc and Quasi-arc elec-

Fig. 2.—The Completed Job.

trodes, and a thoroughly satisfactory job is the result, fig. 2. In view of the fact that this casing had been through the shops and was ready for erection, the valuable saving, both in time and money, resulting from the repair can readily be imagined. In fact, the total cost of welding was negligible compared with the cost of a new casting, and the time taken to complete the repair was approximately one week, as against the five weeks which would have been required to dismantle the machine and prepare a new casing.

An E.P.E.A. Visit.

On May 5th members of the North-West Midland Section of the Electrical Power Engineers' Association paid a visit to Stoke-on-Trent. They were received at the central generating station, Hanley, by Mr. C. H. Yeaman, chief engineer and general manager, who, in an interesting way, related the history of the undertaking, citing the many problems which had to be dealt with in the merging of the different systems of the five towns under one control, and showing how analogous these problems were to those which now confronted the Central Electricity Board. The party inspected the plant, special items of interest being a new 10,000-kW turbo-alternator set and automatically-controlled boiler plant. Later in the day tea was partaken of at the Grand Hotel, Hanley, and was followed by a Section meeting, during which an explanation of the new Overhead Line Regulations was given by Mr. H. S. Ravidson, A.M.I.E.E. After the meeting Mr. Mills conducted the party over several of the main sub-stations, including the new one at the Michelin tire works.

Institution Notes.

Institution of Electrical Engineers.

SCOTTISH CENTRE.—Members of this Centre paid their annual visit to Dundee on April 27th last. Luncheon was taken in the Royal Hotel, and in the afternoon the party paid a visit to the Ashton jute works. In the evening the eighth ordinary meeting of the session was held in the Foresters' Large Hall, Nicol Street, at which Dr. S. Z. de Ferranti, F.R.S., M.I.E.E., delivered his Faraday Lecture on "Electricity in the Service of Man," Lord Provost High presiding in the unavoidable absence of the Rt. Hon. the Earl of Airlie. The lecturer was listened to with keen interest, and on the motion of Mr. D. Macfarlane Macleod, chairman of the Scottish Centre, he was accorded a cordial vote of thanks. On Saturday, April 28th, there was an excursion by road to Edzell, *via* Glamis and Kirriemuir. Luncheon was served in the Panmure Hotel, Edzell, and time was allowed for a round at golf or for a short ramble in the neighbourhood. The return journey was made *via* Brechin, Arbroath, and Carnoustie, tea being served in the Bruce Hotel at the last-named place.

LONDON STUDENTS' SECTION.—The Committee's report for the session 1927-28 shows that the number of students in the Section was 1,363, a decrease of 52 since April, 1927. During the session ten meetings were held, the average attendance being 76, as against 63 last year, and 104 during the session 1925-26. The record attendance was again at the joint meeting held with the Institutions of Civil and Mechanical Engineers. The Committee was pleased to note the increased attendance, but felt that the low percentage of 5.6 was not satisfactory. The standard of papers was higher than last year, but not sufficient were offered for selection by the Papers Committee. The number of visits during the session was twelve, and they proved an exceptionally popular feature; the average attendance was 88 per cent., but the social functions were not well attended.

STUDENTS' SUMMER MEETING.—The London Students' Section announces that the annual tour this year will be in Holland and Western Germany during the beginning of August next.

The Institute of Metals.

The Council of the Institute of Metals has just issued a preliminary programme of the four-day annual autumn meeting of the Institute, which is to be held this year in Liverpool. The proceedings will begin on September 4th with a lecture on "Non-Ferrous Metals in the Shipping Industry" by Mr. F. G. Martin, B.Sc. The mornings of September 5th and 6th will be devoted to the reading and discussion of papers, and the afternoons to visiting works of interest in the neighbourhood, the Gladstone Dock, and a large liner. In the evening of September 6th there will be a reception at the Town Hall by the Lord Mayor (Miss Margaret Beavan, J.P.). The meeting will conclude on September 7th with an all-day motor trip to North Wales, during the course of which it is expected that an electric power station and aluminium works will be visited. Full particulars of the meeting, and membership application forms, can be obtained from the hon. local secretary, Mr. H. F. Richards, B.Sc., 42, Bedford Street, Liverpool.

Royal Institution.

The annual meeting of the Royal Institution was held on May 1st, Dr. Mitchell Bruce, vice-president, in the chair. The annual report of the Committee of Visitors for the year 1927 and the report of the Davy Faraday Research Laboratory Committee were read and adopted. During the year 75 new members were elected, and 63 lectures and 19 evening discourses were delivered. The following gentlemen were elected as officers for the ensuing year:—President: The Duke of Northumberland; treasurer: Sir Arthur Keith; secretary: Sir Robert Robertson.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

The Industrial Australian and Mining Standard announces that Mr. R. VINE HALL, distribution superintendent for the Electricity Department, Sydney, has been appointed acting deputy general manager of the department during the absence of Mr. Maling.

The Chesterfield Electricity Committee has agreed to the provisional appointment of Mr. J. F. PEAKER as mains superintendent and assistant manager, and Mr. G. H. DAVIES as station superintendent. The resignation of Mr. S. H. FOWLES, assistant electricity manager, has been received.

Mr. W. H. WALTON has been nominated president of the E.C.A. Allied Associations for the 1928-29 period, while Mr. H. WILLOUGHBY ELLIS has been nominated vice-president.

Sig. ING. G. MOTTA has just been elected president of the Italian Unione Nazionale Fascista Industrie Elettriche.

Mr. A. J. SEARS, who has hitherto been the technical adviser and head of the Electrical Department of Messrs. W. B. Dick & Co., Ltd., has been appointed a director of the company.

The Times reports that Sir ROBERT HADFIELD has been elected a Foreign Associate of the National Academy of Sciences of Washington.

Southport Electricity Committee has appointed Mr. FRANK L. RIDGE, of Kingston-on-Thames, to fill the recently advertised vacancy for a shift engineer.

Last week Mr. R. S. ASHER, of Edinburgh, was chosen by York Tramways Committee as manager of the City Corporation electric tramway system in succession to Mr. Bromley, who has been appointed manager at Durban, South Africa. The appointment is subject to confirmation by the Council. Mr. Asher, who has been for the last six years permanent-way engineering assistant to the Edinburgh Corporation tramway system, was formerly engineering assistant in the borough surveyor s office, Aberdeen, and permanent-way engineer to the Aberdeen Corporation Tramways. He has also had experience in Canada.

According to statements published in the daily newspaper and financial Press, Sir HERBERT HOLT, the president of the Montreal Light, Heat and Power Corporation, has joined the board of Hydro-Electric Securities Corporation as chairman, and Messrs. J. H. GUNDY and P. N. GRAY as directors. It is stated that an advisory committee has been formed, composed of Major A. Pam, Mr. F. A. Szarvasy (of the British Foreign and Colonial Corporation) and of Captain Loewenstein, which will be consulted on all important questions. Dr. Parshall will be manager and technical adviser. It is further stated that Sir Herbert Holt and Mr. J. H. Gundy have joined the board of the International Holding and Investment Co., and Sir Herbert Holt has been elected chairman.

Mr. F. H. ROSENCRANTS, B.Sc., engineering director of International Combustion, Ltd., London, W.C., who has recently been out to Central and South America, returned to England in time to read his paper on the "Combustion of Coal," at the Institution of Electrical Engineers in London last week.

The special sub-committee appointed in connection with the reorganisation of Glasgow Corporation Electricity Department met on May 4th, when 32 applications were submitted for the position of chief engineer of the electricity undertaking rendered vacant by the resignation of Mr. R. B. MITCHELL. Among the applicants are a number of outstanding engineers throughout England and Scotland, but it is felt in some quarters that a higher salary than the commencing one of £1,500 should have been offered to attract a larger number of suitable men. The short leet of seven drawn up on Friday was not officially announced, but it is understood to include the names of Mr. MORGAN, who is at present acting as interim manager of the department, Mr. MACDONALD, the electrical engineer for the Tramways Department, and a leading employé of one of the chief electricity companies in Scotland. A sub-committee will meet this week to interview the candidates on the short leet and to make recommendations. The Committee on Superannuation has had under consideration the amount of the retiring allowance which should be paid to Mr. Mitchell. A sum of £700 a year is mentioned, but no definite decision has yet been arrived at.

The Bromley (Kent) Town Council has increased the salaries of the borough electrical engineer and the assistant engineer by £50 each per annum.

The *Financial Times* states that the name of Sir CHARLES BUCKWORTH HERNE SOAME, Bart., has been ordered by the Committee constituted under the Solicitors Acts, to be struck off the Roll of Solicitors. "The committee found that he had been guilty of misconduct in respect of matters for which he was convicted at the Central Criminal Court of conspiracy to defraud."

Reigate Electricity Committee recommends that an honorarium of £100 be paid to the borough electrical engineer for duties carried out by him as clerk of works in connection with the contract for the new system of electrical mains, £50 to be paid forthwith, and the balance when the contract is completed to the satisfaction of the consulting engineers.

The recommendation that Mr. THOMAS W. HIBBERT, assistant borough electrical engineer at Doncaster, be appointed borough electrical engineer, which was mentioned in our last issue, has been passed by the Council.

Mr. A. C. HANSEN, chief statistical and correspondence clerk in the Liverpool Electric Supply Department, has been appointed engineer's secretary, at £500 per annum, to fill the vacancy caused by the superannuation of Mr. C. H. Smith.

Mr. W. E. WANSTALL BEERLING, late Northern sales engineer of the Hotpoint Electric Appliance Co., has been appointed manager of the domestic section of the Electric Cooking and Heating Department of Carron Company, Carron.

The Bermondsey B.C. Electricity Committee has had under consideration the question of filling the vacancy which will arise through the retirement of Mr. W. E. J. HEENAN, the borough electrical engineer. The erection of new plant in connection with the bulk supply arrangement renders it necessary that the appointment should be fixed without delay, and the Committee is unanimously of opinion that Mr. DORAN, the acting borough electrical engineer, who has been in the service of the Council since 1904, should be appointed at £1,000 per annum, rising by two annual increments of £100.
and Co., left £27,326 gross and £26,249 net personalty.

Modern Transport says that Mr. C. M. JACOBS has been appointed signal engineer to the Great Western Railway in succession to the late Mr. R. S. Insell. In 1918 Mr. Jacobs read a paper on electrical signalling before the Institution of Electrical Engineers.

Messrs. Philips Lamps, Ltd., have appointed Mr. F. E. H. BARRATT, late radio manager to the British Thomson-Houston Co., Ltd., to be in charge of the radio section at their Manchester branch. Mr. Parratt will collaborate with Mr. F. R. Roberts, lamp manager for Messrs. Philips in this territory.

Obituary.—MR. H. E. PRATTEN.—The sudden death of the Hon. Herbert Edward Pratten while addressing a meeting in a Sydney suburb on Monday last must have come as a shock to the many men who came into touch with him during his visit to London last summer. As Minister for Trade and Customs in the Commonwealth of Australia, he did his utmost to encourage the erection of additional works there, and with certain classes of British manufacturers he conferred to good effect. Efforts were made here by responsible people, Australians and others, to endeavour to bring home to his mind the position of British electrical industry and reasons for and against their carrying out local production in the Commonwealth, but his visit was a short one, and electrically the result was small and brought little, if any, encouragement. Mr. Pratten was born at Bristol, went to Australia at the age of 20 years, became a prosperous trader, and was a strong advocate of Australian tariff protection. He was 63 years of age. It is impossible to say whether his death will affect Australian trade policy, or whether it will in any way alter the arrangements for the British Mission which visits the Commonwealth late this summer. He promised British manufacturers who opened branch factories there that they should have every assistance—it is unlikely that there will be any material change in this respect.

MR. H. E. KERSHAW.—We have to record that Mr. Harry Edward Kershaw, who was Mayor of Shoreditch in 1900 and was prominently associated with the Borough Council's electrical activities and subsequently was interested in a renewable electric lamp company which did business in the borough, passed away suddenly on Wednesday night last week. His death occurred while attending a meeting of the Egham Urban District Council, of which he was a member.

MR. S. A. WALKER.—The *Electrical Contractor* reports the death of Mr. Sydney A. Walker, of Messrs. Walker Bros., Birmingham. Mr. Walker was a member of the E.C.A. Council for three years.

MR. C. E. RAEBURN.—The death occurred suddenly on April 29th, at Old Trafford, Manchester, of Mr. Charles Edward Raeburn, electrical engineer with the Metropolitan-Vickers Electrical Co., Ltd.

Wills.—The late Mr. E. J. CLARK, of the Hart Accumulator Co., Ltd., left £50,949 gross and £47,435 net personalty.

SIR ROBERT SCOPE, a director of Messrs. Clarke, Chapman and Co., left £27,326 gross and £26,249 net personalty.

Mr. ALEXANDER SIEMENS left £7,277 gross personalty; net personalty nil.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Twentyman & Willmott, Ltd.—Private company. Registered April 30th. Capital, £800 in £1 shares (400 6½ per cent. cumulative preference and 400 ordinary). To adopt an agreement with F. W. Twentyman and to carry on the business of electrical engineers and contractors formerly carried on by him at 31, Ashchurch Grove, Hammersmith, W.12, and that of mechanical and general manufacturers of radio apparatus, instrument makers, &c. The first directors are:—F. W. Twentyman, 31, Ashchurch Grove, W.12, electrical engineer; A. Willmott, A.M.I.E.E., &c., 8, Hill View Gardens, North Harrow, electrical engineer. Secretary: H. Cavenagh, 55, Newhall Street, Birmingham. Registered office: 39, Brook Green Road, W.6.

Halsey's Electric Co., Ltd.—Private company. Registered April 28th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers of, and dealers in, all kinds of electrical goods, wireless receivers and instruments, drawn wire, electric cabling, electric lamps and all parts used in connection with electrical, telegraphic, telephonic, and wireless instruments, &c. The subscribers (each with one share) are:—P. L. Halsey, "Keithfield," Southchurch Road, Southend-on-Sea, electrical engineer; R. A. Parish, 72, Argyle Gardens, Upminster, Essex, accountant. The first directors are not named. Registered office: 24, Great Eastern Road, Stratford, E.15.

Piccadilly Signs, Ltd.—Private company. Registered May 1st. Capital, £1,500 in 1,400 7 per cent. non-cumulative preference shares of £1 each and 1,000 ordinary shares of 2s. each. Objects:—To acquire (1) the business of a sign manufacturer and dealer in signs carried on at 23, Charing Cross, S.W.1, by R. J. Carruthers as the Piccadilly Sign Co., and (2) the business of electrical and general engineers carried on at 255, Holloway Road, N.7, by R. J. Carruthers as "Carruthers & Co." The first directors are:—R. J. Carruthers (chairman and managing director), 23, Charing Cross, S.W.1; G. S. Adlington, 5, Dalmeny Avenue, Holloway, N.7. Secretary: G. S. Adlington. Registered office: 23, Charing Cross, S.W.1.

Devereux, Moodie & Co., Ltd.—Private company. Registered May 2nd. Capital, £5,000 in £1 shares (2,500 10 per cent. cumulative preference and 2,500 ordinary). Objects:—To acquire the business of an electrical and general engineer and dealer in leather goods now carried on by A. Moodie at 12 and 14, Eldon Lane, Newcastle-on-Tyne, as "Devereux, Moodie & Co." and "B.A.T. Leather Goods Co." The permanent directors are:—A. Moodie, 4, Hawthorn Gardens, Low Fell, Durham; A. J. Ogle, 20, Elmfield Grove, Gosforth, Northumberland. Solicitors: Frank Kerby & Co., Groat House, Newcastle-on-Tyne.

P. Goddard & Co., Ltd.—Private company. Registered May 2nd. Capital, £1,000 in £1 shares (500 ordinary and 500 10 per cent. participating preference). Objects:—To acquire from P. F. Goddard and C. Miles the business of electricians carried on as Goddard & Co. at 98, Hampstead Road, N.W., to carry on this and the business of mechanical engineers, manufacturers of electrical and wireless apparatus, &c. The first directors are:—P. F. Goddard, 102, Hampstead Road, N.W.1; C. Miles, 34, Manor Road, East Molesey, Surrey, both permanent managing directors.

George Ellis, Ltd.—Private company. Registered April 30th. Capital, £2,000 in £1 shares. Objects: To acquire the business now carried on at 172, Ealing Road, Wembley, and 228, Northolt Road, South Harrow, as "George Ellis," and to carry on the business of electrical, mechanical, and general engineers and contractors, manufacturers of and dealers in electrical, magnetic, galvanic, and other apparatus, &c. The first directors are:—R. E. Fenwick (permanent chairman and managing director), St. Mawes, Wood Grange Avenue, Kenton, Nr. Harrow; G. F. W. Fairbrother, 172, Ealing Road, Wembley. Registered office: 172, Ealing Road, Wembley.

Three Spires Electric, Ltd.—Private company. Registered May 2nd. Capital, £500 in £1 shares. Objects: To carry on the business of electrical, lighting, heating, wireless, mechanical and general engineers and engineering contractors, &c. The subscribers (each with one share) are:—D. W. Burrows, 71, Raglan Street, Coventry; A. F. Yarnall, 13, Hill Cross, Coventry, electrical engineers. F. E. Brown signs as director. Registered office: 30, Union Street, Coventry.

Wholesale Supply Co. (Hull), Ltd.—Private company. Registered April 30th. Capital, £4,000 in £1 shares. Objects: To acquire an electrical supplies and motor and cycle accessories business now carried on by B. Fox and R. Dalton at 11-12, Mytongate, Hull, and elsewhere, and to carry on the business of wireless, electrical, mechanical, motor and general engineers, &c. The permanent directors are:—B. Fox, 12, Stirling Street, Hull; R. Dalton, "Woodside," Swanland Road, Hessle, E. Yorks. Qualification: £250 ordinary shares.

Auto Electrical Service Co., Ltd.—Private company. Registered April 28th. Capital, £3,000 in £1 shares. Objects: To acquire the business of an automobile electrical engineer carried on by E. G. E. Ford as the "Auto Electrical Service Co." at 519, Green Lane, Goodmayes, Essex. The first directors are:—E. G. E. Ford and Mrs. E. M. Ford, 22, Aberdour Road, Goodmayes, Essex. Secretary: S. Oliver. Registered office: 519, Green Lane, Goodmayes, Essex.

Autocar Electrical Equipment Co., Ltd.—Private company. Registered April 28th. Capital, £5,000 in £1 shares. Objects:—To acquire the business of an automobile electrical engineer heretofore carried on by E. G. E. Ford as the "Autocar Electrical Equipment Co." at 115, Old Street, E.C. The first directors are:—E. G. E. Ford and Mrs. Edith M. Ford, 22, Aberdour Road, Goodmayes. Registered office: 115, Old Street, E.C.1.

Harold Taylor & Co., Ltd.—Private company. Registered May 4th. Capital, £5,000 in £1 shares. Objects: To acquire the business of electrical and mechanical engineers, contractors and factors, and plumbing and jointing contractors carried on by H. Taylor and K. B. Joist at 24, Aldermanbury, Bradford, as "Harold Taylor." The first directors (to number not less than three nor more than seven) are:—H. Taylor, 62, Woodhall Avenue, Thornbury, Bradford, electrical engineer (chairman); K. B. Joist, "Moormeads," Salisbury Avenue, Baildon, electrical engineer; C. N. Cheetham, "Greencroft," Guiseley, gentleman; G. H. Brayshaw, 2, St. Margaret's Terrace, Bradford, agent. H. Taylor and K. B. Joist are permanent. Qualification £100. Solicitors: Moore and Shepherd, 9, Sundridge Road, Bradford.

Furnace Electric Heating Co., Ltd.—Private company. Registered May 4th. Capital, £1,000 in £1 shares. Objects: To carry on the business of electricians, workers in electricity, metal workers, coppersmiths, electroplaters, manufacturers of electrical furnace fires, electrical fires and stoves, &c. The first directors are:—H. G. Westlake, 16, Fountain Street, Halifax; G. Bottomley, 7, West Grove Terrace, Halifax; L. Hartley, Holm Garth, Halifax. The said H. G. Westlake shall be permanent managing director so long as he holds £50 shares. Qualification of directors £50 shares. Solicitor: W. H. Lord, 8, Harrison Road, Halifax.

Combustion Control, Ltd.—Private company. Registered May 4th. Capital, £3,000 in 5s. shares. Objects: To carry on the business of patentees and licensees of patents, and agents or representatives of patent holders and mechanical engineers, &c. The first directors are:—Major R. G. C. Glyn, M.P., 22, Manchester Square, W. (director of Greenwich Cable Works, Ltd.); B. H. Binder 38, Hyde Park Gate, S.W.7. Qualification, £25 shares. Secretary: P. R. Scutt. Registered office: Bush House, Aldwych, W.C.2.

Official Returns of Electrical Companies.

Electrical Appliances (Blackpool), Ltd.—Particulars filed on April 17th of £6,500 debentures authorised January 23rd, 1928, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,650.

Frank Peasgood, Ltd.—Particulars filed of £300 debentures authorised April 12th, 1928, charged on the company's undertaking, including uncalled capital, the whole amount being now issued.

Hill Bros. (Magnetos), Ltd.—S. Malachi Bond, 19, Temple Street, Birmingham, was appointed receiver on April 23rd, 1928, under powers contained in debenture dated June 1st, 1921.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd.—Issue on April 18th, 1928, of £500 debentures, part of a series already registered.

Oswestry Electric Lighting and Power Co., Ltd.—Issue on April 19th, 1928, of £300 debentures, part of a series already registered.

Auto-Bulbs, Ltd.—R. F. W. Fincham, 3, Warwick Court, Gray's Inn, W.C.1, ceased to act as receiver or manager on April 13th, 1928.

Erith Electrical Co. (Barber & White, Ltd.).—L. G. Darling, 87-89, Aldgate High Street, E.1, was appointed receiver and manager on April 20th under powers contained in instrument dated January 25th, 1928.

Austin Brothers Electrical Co., Ltd.—Capital, £1,000 in 300 preference and 700 ordinary shares of £1 each. Return dated June 16th, 1927 (filed March 5th, 1928). All shares taken up. £700 paid. £300 considered as paid. Mortgages and charges, nil.

Tidal Power Syndicate, Ltd.—Capital, £30,000 in 2s. shares. Return dated December 31st, 1927 (filed April 7th, 1928). 276,507 shares taken up. £27,650 14s. paid. Mortgages and charges, £28,700.

Albany Accumulators, Ltd.—Capital, £1,000 in £1 shares. Return dated September 20th, 1927 (filed March 6th, 1928). 206 shares taken up. £202 paid. £4 considered as paid. Mortgages and charges, nil.

David J. Patten, Ltd.—Capital, £5,000 in £1 shares. Return dated April 26th, 1927 (filed February 13th, 1928). All shares taken up. £2,261 paid. £2,739 considered as paid. Mortgages and charges, £1,500.

John Belton & Co., Ltd.—Capital, £3,000 in £1 shares. Return dated April 28th, 1927 (filed March 19th, 1928). All shares taken up. £3,000 paid. Mortgages and charges, nil.

Ferryside Electric Supply Co., Ltd.—Capital, £1,200 in £1 shares. Return dated December 31st, 1927. 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Galliers (Wholesale), Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1927 (filed March 31st, 1928). 100 shares taken up. £50 paid; £50 in arrears. Mortgages and charges, nil.

H. T. Bourn, Ltd.—Capital, £800 in £1 shares. Return dated December 31st, 1927 (filed March 7th, 1928). 680 shares taken up. £680 paid. Mortgages and charges, nil.

White & Mantle, Ltd.—Capital, £1,000 in £1 shares. Return dated December 31st, 1927 (filed April 4th, 1928). 551 shares taken up. £301 paid. £250 considered as paid. Mortgages and charges, nil.

Hartley Engineering Co., Ltd.—Particulars filed of £1,000 second debentures authorised March 22nd, 1928, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Lacy Patents Holding Co., Ltd.—Capital, £2,000 in 1s. shares. Return dated December 31st, 1927 (filed March 12th, 1928). All shares taken up. £1,000 paid, £1,000 considered as paid. Mortgages and charges, nil.

British Boiler Fluid and Engineers' Stores Co., Ltd.—R. W. O'Donoghue, of 44, Decima Street, Bermondsey, was appointed receiver and manager on April 11th, 1928, under powers contained in debentures dated November 14th, 1905.

V. Badman, Ltd.—Particulars filed of £200 debentures authorised April 21st, 1928, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £25.

City Notes.

English Electric Co., Ltd.

Mr. W. L. Hichens (chairman) presided at the annual meeting on April 30th, and in presenting the report and accounts (ELEC. REV., April 27th, p. 744), recounted the reasons for the aggregate loss of £399,899 shown in the company's accounts. During the past year, he said, there had been a trading profit of £76,256, which was £66,000 above the profit for 1926. There had, however, been a large increase (£88,493) in respect of additional depreciation on patterns, drawings, tools, &c. The annual expenditure on these items was necessarily heavy. In spite of the large writing-down, however, their capital value had grown from year to year, and the time had come when the amount provided for depreciation should be at least equal to the expenditure on those items for the year. At this stage it was not desirable to go further, but later on they would endeavour to provide an even larger sum towards the writing-down of the capital figure, which was still far too high. There were three items of special expenditure during the year not properly chargeable to revenue. During 1926 and 1927 an extensive reorganisation had been undertaken which involved a special expenditure, largely in compensation to displaced officials, of about £34,000. As the economies already effected amounted to about £200,000 a year, the expenditure was not excessive. The stock had been re-valued and now appeared at conservative figures; this together with a small loss on the sale of the Lytham aircraft works had absorbed £67,500. A further £22,700 was accounted for by the company's liability in respect of certain plant manufactured in previous years and of patent fees. It has also been considered desirable to make a provision of £63,000 in respect of a disputed claim for income tax. The foregoing arrangements had been made after a thorough investigation by a firm of accountants. Provided that future trading losses could be avoided, the existing financial facilities of the company should prove sufficient. The report referred to the necessity for the revaluation of the fixed assets and investments in the event of any scheme of rearrangement of capital being put forward. This applied particularly to the Ordnance Works, Coventry. Had the company been able to make full use of those works it would have made a very good bargain, but unfortunately they had been practically closed since 1922. It was intended to dispose of the works if a favourable offer was made, but in view of their size a purchaser might not be found easily. Proceeding to deal with the causes of the company's losses, Mr. Hichens said that the company was formed immediately after the war, when prices were soaring and hopes were extravagant. A heavy capital expenditure was immediately necessary in order to develop new lines of manufacture and new designs, and to re-group the work in the manner best adapted to the new organisation. That large outlay had to be undertaken when prices had reached their peak. Then came the slump with depreciation of assets, which was accentuated by the Government's policy of currency deflation. On the Continent the maintenance of inflated currency saved industrialists from the necessity of depreciating their assets. Our Government's policy was certainly right, but it threw a responsibility upon individual firms for writing down their assets, and companies which had had to make heavy post-war expenditure were particularly badly affected; the English Electric Co. was one of those companies. At the time of the formation of the company they looked forward to an immediate large expansion of the electrical industry which would suffice to fill all the works of the company. Unfortunately, their hopes proved to be ill-founded, although he believed that a big expansion would come in the not far-distant future. It became clear that the volume of work was insufficient to keep the works fully employed, and it was essential to success that the works of a large modern organisation should be producing at full capacity. To-day the capacity of the industry as a whole was greatly in excess of the demand; in consequence competition had been keen and prices in many cases had been cut below the economic level. Leaving those aspects of the position, the chairman said he would deal with the brighter side. During the last four years, through the Power & Traction Finance Co. and other associated companies, important foreign orders had been secured. Contracts amounting to over £8,000,000 had been booked and financed, resulting in the expenditure of more than half of that sum in Great Britain. That was largely due to Mr. Pybus, the chairman of the Power and Traction Finance Co. They were associated with big schemes in Poland, Greece, Hungary, the Sudan, and Egypt. In Athens the new electricity companies founded by the Power and Finance Co., in conjunction with a group of Greek banks, had made a great advance, and orders for plant and machinery had been placed in this country. They were still, however, in a state of transition, as the final construction programme had not yet been completed. This included a 45,000-kW power station, for which the English Electric Co. were sole contractors, and the auxiliary works, including h.p. transmission lines, sub-stations, and distribution network. It was hoped that the station would be in operation early next year. Their part of the recently-inaugurated public utility services in the Sudan included the supply of two Fullagar units for the power station, sub-station plant, the waterworks and mains and the tramways. Those services would be operated for many years on behalf of the Government by the Sudan Light & Power Co., the chairman of which was one of the directors of the English Electric Co. The Power & Traction Finance Co., in conjunction with Messrs. Ganz, had also obtained the order for the construction of a 65,000-kW power station near Budapest; a great part of the energy from this would be used by the State Railways when the electrification of the main line from Budapest to the Austrian frontier was completed. That electrification work would also be entrusted to the same two firms. The total value of those contracts was £2,000,000, half of which would be spent in this country. Mr. Hichens then made reference to the Post Office tube, the whole of the contract for which was entrusted to the company, and said that the results already attained were striking. That work opened up an interesting vista of possible developments and suggested that the time might come when all underground railways would be run automatically. After mentioning the company's hydro-electric work and the supply of 132,000-V transformers to the Central Electricity Board, the chairman said that the orders booked during the first quarter of the current year were nearly double the value of those taken during the corresponding period of last year. In conclusion, he pointed to the very large economies which had been effected and to the constant endeavour to improve the efficiency of the plant, and paid a special tribute to Mr. Watlington. Sir Charles E. Ellis, G.B.E. (deputy chairman) seconded the motion. A discussion ensued, when an amendment was moved that the report and accounts "be received but not adopted," but this was defeated, and the motion was carried.

Johnson & Phillips, Ltd.

The annual meeting was held on May 3rd, under the chairmanship of Mr. J. Macgregor. In moving the adoption of the report (*vide* our last issue, p. 787), the chairman, after referring with regret to the resignation of Mr. W. C. Johnson, said that the profits for the year were slightly less than those of the previous year, although the turnover had been larger. His predecessor in office referred at last year's general meeting to the keenness of competition, and this had notably increased during the year under review. They had done well with their cables, but the competition in transformers and switchgear had been particularly severe. The primary cause of that severe competition was the fact that there had not been, and there still was not, sufficient work available to occupy fully the productive capacity of the British electrical manufacturing industry, a capacity which had been greatly enlarged of recent years. That it had been so enlarged was due to the universal recognition of the great developments which lay before the industry, but there was no doubt that those developments had taken longer to mature than might reasonably have been expected. The revival of our staple industries had been confidently prophesied from year to year, but their financial difficulties delayed them in carrying out those programmes of modernisation, electrical and otherwise, which could help to restore their prosperity. The Electricity Supply Act, 1926, had in coming into action, caused that transitional slackening in the general demand, which they hoped would soon be adjusted and result in larger and ever-increasing orders. In those circumstances he thought the shareholders might congratulate themselves that the company, a purely manufacturing concern, had with the aid of its thorough distributing organisation succeeded in doing an increased volume of business at a profitable rate. A certain amount of business had also been done, which while not immediately profitable, the directors regarded as essential in the building up of the business for the future. But on the turnover as a whole, a satisfactory return had been secured. The prospects for the current year might, he thought, be regarded as hopeful. Uncertainties with regard to the Electricity Act were being cleared up, and industry generally was gradually recovering from the disasters which befell it in 1926. Certain measures of relief of which they had heard a good deal lately, would also, no doubt, help to create that atmosphere of confidence and hope which was essential to enterprise. Having been relatively so fortunate in the lean years, they might, he thought, confidently look forward to a share of any increased prosperity which the future might have in store for the nation. Sir Philip Dawson, M.P., in seconding the motion, referred to the future prospects of the industry, and said that the Electricity Act was gradually coming into effect, and as the results of the Act became apparent there would undoubtedly be an increase in the use of every class of apparatus connected with the production and utilisation of electricity, and more especially for the articles which the company manufactured. There was a time when distributors thought that the new Act was unfair and limited their powers. That fear had now disappeared, and those interested were attempting to extend the areas of distribution as much as possible. There were a great many areas in this country which hitherto had had no supply of electricity, for which to-day provisional orders were being granted, which would lead to the need for the production of electricity on a large scale. The interregnum had been rather longer than some of them anticipated, but he thought that time was shortly coming to an end and the extension of the use of electricity would enable the industry to be more usefully engaged in the future than it had been in the past. Electricity had suffered much in this country from lack of propaganda. In his opinion if they only used the same amount of propaganda as the gas industry, there would now be a far larger consumption of electricity than was actually the case. He believed that within the next year or two the demand for every kind of electrical supply and for all the details which made that supply possible, would increase so rapidly that manufacturing companies would no longer be in their present position of having to meet unnecessarily severe competition because there was over-production. Answering questions, the chairman said that the debenture in the Burndept Company was a perfectly sound asset, for the company had turned the corner. If its reconstruction scheme went through, the company's indebtedness to its bankers and Johnson & Phillips would be paid off and working capital would be available. The report was then adopted.

British Thomson-Houston Co., Ltd.

The annual meeting was held on May 2nd, Mr. H. C. Levis (chairman) presiding. In proposing the adoption of the report (*vide* our last issue, p. 788), the chairman said there had been no diminution in the keen competition which the company had had to face, yet the output from the factories had been considerably greater than in the previous year, but while the total profits for the year were in excess of those for 1926, they were not adequate. Arrangements had been made with the Metropolitan-Vickers Electrical Co., Ltd., which were expected to lead to eliminating unnecessary duplication of effort and expenditure, and to effecting economies generally in various directions, such as research, engineering development, manufacturing processes, and the purchase of materials. Progress had been made in a similar direction with the Edison Swan Electric Co., Ltd., and Ferguson, Pailin, Ltd. The financial position continued to be strong, and were it not for the undue competition to which he had referred, the company could look forward with confidence to the future, as the demand for electrical apparatus and appliances was increasing, and should continue to increase. From the formation of the company, there had been spent on manufacturing plant up to December 31st, 1927, £3,935,984. There had been dismantled, sold or otherwise disposed of £90,203, leaving the cost of the present manufacturing plant £3,845,781. From time to time this had been depreciated to the extent of £1,366,770, all of which had come out of profits, which left the net book value on December 31st, 1927, £2,479,011. Referring to statements in the Press to the effect that the company was controlled by the International General Electric Company of New York, the chairman said that all of the debentures and preference shares were held in Great Britain, while the International General Electric Company held a large block of the ordinary shares and all of the unsecured debt, and that meant that it had had the faith and courage to help build up that great industry, and had been content with a very modest return on its investment, hoping and expecting that in the course of time it would prove to be a reasonably profitable undertaking, just as so many enterprises had been financed abroad by British capital; and it must always be remembered that that interest in the company had not been taken with the idea of promoting and fostering the importation into this country of electrical apparatus and appliances manufactured abroad, but, on the contrary, to encourage manufacturing here, everything which the company sold, from the smallest lamp to the largest turbo-alternator set. The company's employés numbered nearly twelve thousand. The more outside capital could be attracted to any country, even a country with the stupendous resources of our own, the better it was, as it meant more employment, greater purchasing power and more trade. Even if dividends at a high rate had been paid on the ordinary shares, the outgoings in that direction would have been a mere speck compared with the amounts distributed in wages. That portion of the capital which was reasonably certain of its return was held here; it was merely the portion on which the return was uncertain, which was held by the International General Electric Company.—The report was adopted.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

Atlas Light and Power Co., Ltd.—210,000 ordinary shares of £1 each, fully paid, Nos. 2,425,212 to 2,635,211; 220,000 7 per cent. preference (cumulative) shares of £1 each fully paid, Nos. 2,530,001 to 2,750,000; £510,865 6 per cent. debenture stock and £216,350 5 per cent. debenture stock.

Delhi Electric Supply and Traction Co., Ltd.—130,000 shares of £1 each fully paid, Nos. 1 to 130,000.

Marconi's Wireless Telegraph Co., Ltd.—113,772 ordinary shares of £1 each, fully paid, Nos. 3,000,066 to 3,113,837.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Delhi Electric Supply and Traction.—30,000 shares of £1 each, fully paid, Nos. 100,001 to 130,000.

Underground Electric Railways of London.—56,874 ordinary shares of £1 each, fully paid, Nos. 5,148,753 to 5,205,626.

Brush Electrical Engineering Co., Ltd.

The trading profit for the year ended December 31st last fell from £135,464 to £134,893. The net profit, after providing for general charges, debenture interest, depreciation, &c., was £2,623 higher at £65,510. Of this, £5,757 is transferred to general reserve in accordance with the co-partnership deed; 10 per cent. is paid on the ordinary shares, as in 1926; and a further 4 per cent. interest is paid on the prior lien participating second debenture stock; leaving a surplus of £10,763 for apportionment between the shareholders and co-partners. The shareholders' part, £1,822, is added to the undivided profits account, and that of the co-partners (£8,941) is included among "sundry creditors." The general reserve now stands at £245,977. The sum of £32,135 was spent on capital account during the year. Satisfaction is expressed in the report at the working of the co-partnership scheme during the past two years. From the 1926 profits, £7,354 was credited to the co-partners; of this they elected to take £4,330 in the form of shares and the balance in cash. During the year 10,880 £1 ordinary shares were issued to co-partners (in respect of 1925 and 1926), raising the ordinary capital to £469,451. The report says that notwithstanding the continuance of increasingly severe competition in all lines of the company's manufactures, in home and foreign markets, the shops were well employed throughout the year, and a satisfactory volume of orders was carried into the current year. Mention is made of the resignation of Mr. C. Shirreff Hilton from the board. Meeting: May 14th.

Sir W. G. Armstrong, Whitworth & Co., Ltd.

The report for the past year shows that, although the trading profit increased from £140,583 to £388,667, there was a net loss of £527,953 (against £531,210) after meeting interest charges and providing £250,000 for certain contingencies. Against the deficit is placed a balance of £114,181 brought forward, reducing it to £413,771. This is met from general reserve, which is thereby reduced to £86,228. The report foreshadows a "drastic readjustment of values" and a scheme of reorganisation when the possibilities of the company are definitely known.

Craigpark Electric Cable Co., Ltd.

The accounts for the year ended March 31st last show a gross profit (including £19,233 transferred from general reserve) of £33,744. The available balance is £15,594, to which is added £585 brought forward, making £16,179. Depreciation absorbs £2,000, £7,607 is transferred to reserve, the preference dividend is paid, and the ordinary shares receive 4 per cent. for the year (against 7½ per cent. for 1926-27), leaving a balance of £2,222 to be carried forward, subject to the payment of directors' fees. The report says:—"In 1925 your directors had to consider what their policy should be in view of the importance of securing adequate supplies of the class of rubber most suitable for the company's trade looking to the high price of spot rubber at the time and to the fact that it could be purchased for future delivery at considerably lower prices. Certain contracts for deliveries of rubber extending into 1928 were made, and these purchases have proved to be unfortunate, as the price of rubber has continuously fallen since the early part of 1926. The directors have, therefore, transferred from the general reserve account to special reserve account against fluctuation in price of raw materials £26,606 16s. 8d., which with the profit on the sale of investments referred to below will meet the cost of rubber consumed during the year just ended in so far as that exceeded 1s. 7d. per lb., and the cost of rubber either in stock or still to be delivered in so far as that exceeds 9d. per lb." During the year investments were realised and the profit resulting therefrom (£2,202) has been transferred to the special reserve fund. The output of the factory has steadily increased, but foreign competition has had a severe effect on the prices obtainable throughout the year. Mr. David Todd has, owing to continued ill-health, retired from the board, and Mr. T. L. Duff, Glasgow, is to be elected in his place.

Shanghai Electric Construction Co., Ltd.

Mr. J. S. Haskell presided at the annual meeting on May 3rd, and in moving the adoption of the report and accounts (*vide* our last issue, p. 788), said that having regard to the difficulties experienced during the year, the result was evidence of the stability of the company's service. The city was occupied by troops during practically the whole of the year, and such parts of the company's routes as lay outside the defences were closed down. There had also been labour troubles which involved the closing down or curtailment of services, as well as loss of traffic by the threatening of passengers. Their thanks were due to the Shanghai Municipal Council for its capable administration and to the local officials and staff of the company for their courage and loyalty. The effect of the interruptions of the services, &c., was the reduction of the car-mileage by 11 per cent. and the number of passengers by 21 per cent. Owing to the raising of the fares in May last year, however, the net effect upon the receipts was a reduction of only 2 per cent. The working expenses were increased, reducing the operating profit by £11,300. They had exercised economy in capital expenditure and had made a substantial reduction in their indebtedness to the bank. With more settled conditions, it would now be necessary to proceed with the agreed programme of extensions. The favourable tendency of traffic in Singapore continued, and had there been no boycott the Singapore Traction Co.'s revenue would have increased considerably, as it was increasing now.

Indo-European Telegraph Co., Ltd.

The annual meeting was held on April 30th, Mr. H. L. M. Tritton (chairman) presiding. In moving the adoption of the report (ELEC. REV., April 27th, p. 744), the chairman said the slight increase of revenue for 1927, despite losses due to "beam" competition, as compared with 1926, could be explained partly by a satisfactory increase in the receipts from subsidiary traffics, and partly by the fact that revenue in 1926 suffered a certain loss owing to the strike of the company's Russian employés. The "beam" competition with India began to operate in September, 1927, and its effect was therefore limited to less than four months. It was necessary to bear in mind that the company's revenues during the current year would reflect the loss involved by reason of this competition. Consequent upon the introduction of the rate of 1s. 1d. per word to India by "beam" wireless, the company's rate for ordinary telegrams was reduced in September. The rates for telegrams to Iraq were also reduced on April 1st. The results for the year showed slightly more than 2½ errors for 10,000 paid words transmitted, or 0.025 per cent. Arrangements had been made, in co-operation with the Indo-European Telegraph Department, for facilities for direct working between Karachi and Berlin on a special circuit in the interest of German and other Continental users. The report and accounts were adopted.

Lanarkshire Tramways Co.

Speaking at the annual meeting on April 30th, Mr. A. R. Monks (chairman) referred to the death of Mr. G. F. Pollock and to the appointment of Major R. W. Sharp to the board. He said that Mr. Levis was retiring from the board, and it was not proposed at present to fill the vacancy. The decrease in the revenue was due to the withdrawal of the company's 'buses from the Hamilton-Glasgow routes. The reduction in the operating expenses was accounted for by lower rates, cheaper energy and the elimination of unremunerative omnibus services. The position of the tramway undertaking caused them great anxiety, for the by-laws had been ineffective in reducing the competition, which came mainly from the Glasgow General Omnibus Co. They had declined to accede to the local authorities' demand that they should remove their track from the old bridge over the Clyde to a new one when the latter was built. The authorities had intimated their intention of removing the old bridge when the new one was available; that would make a break in the centre of the company's main tramway route, which would probably involve the closing-down of the whole system. The 'bus undertaking was improving, and they hoped to augment the services in the near future.

Cork Electric Supply Co., Ltd.

Addressing the annual meeting on April 30th, the chairman (Mr. A. R. Monks) said that the reduction in the revenue for the past year was mainly due to decreases in the tramway fares and electricity charges. The reduction in working expenses was considerable, and therefore the amount available was larger and they were able to raise the ordinary dividend from 8 to 10 per cent. For many years the company had financed developments from revenue and had transferred substantial amounts to the reserve, which now stood at £34,624. The directors proposed to capitalise £34,500 of that sum and distribute it in the form of bonus shares in the proportion of one to each three existing ordinary shares. Notice of the necessary meetings would be given to the shareholders in due course. It was expected that negotiations between the company and the Free State Electricity Supply Board would take place shortly to decide whether that Board should acquire the electricity undertaking or provide a bulk supply.

Calcutta Electric Supply Corporation, Ltd.

The profit for the past year amounted to £398,588, and to this is added £31,599 brought forward, making £430,187. It is proposed to transfer £70,000 to reserve, £3,000 to insurance fund, and £2,000 to retiring gratuity fund. A final dividend of 7 per cent. is to be paid on the ordinary shares, making 12 per cent. for the year, as in the preceding year, together with a bonus of 4d. per share. The dividend and bonus are exempt from Indian taxation. Since the last report a bonus issue of one share per ten ordinary shares held has been made.

The report states that the company's business has recovered from the handicaps of 1926, and the Southern station has more than justified anticipations. A substantial reduction has been made in the domestic consumers' charges. The meeting was held on Wednesday last.

Ever-Ready Co. (Great Britain), Ltd.

The profit for the year ended March 31st last was £187,964, as compared with £174,588 in 1926-27. A balance of £26,558 brought forward is added, making £214,522. Of this £35,000 is put to reserve. A final dividend of 25 per cent. is to be paid on the ordinary shares, making 35 per cent. for the year, as for 1926-27. The directors report continued expansion and state that the capital expenditure during the year was £17,000; about £35,000 will be spent during the current year to give effect to the company's policy of expansion and up-to-date production. The sum of £112,529 has been expended in the acquisition of a controlling interest in Continental businesses, from which no revenue was received during the year. It is proposed to divide the £1 ordinary shares into 5s. shares, and an extraordinary meeting for the consideration of the proposal will be held after the annual meeting on May 31st.

Richmond (Surrey) Electric Light and Power Co., Ltd.

This company's report for 1927 was reviewed in our issue of April 27th (p. 744). The annual meeting was held on May 3rd, when Sir Harry Renwick (chairman), who presided, referred to the charges for electricity supply. He said the so-called campaign for cheaper electricity could only have the effect of hindering the growth of demand and thereby tended to stop the reductions of charges which every undertaking was anxious to make as soon as it could see its way to do so. Reduced charges would come with greater demand. In connection with the past year's working of the company, the chairman said the general progress of the business was entirely satisfactory, the company was in a very sound position, and continued progress should be made during the current year. The report and accounts were adopted.

Brand Powdered Fuel System, Ltd.

Last week this company published, for information only, particulars of its constitution and objects. It was formed in January last, with a capital of £200,000, to acquire an exclusive licence for the patents and applications of the Brand system of utilising powdered fuel. The patents cover burners, feeding systems, water-tube boilers, and other apparatus and methods. The licence is acquired from "B. & L." Powdered Fuel, Ltd., for £110,000 (£10,000 in cash and £100,000 in shares).

Hastings and District Electric Tramways Co., Ltd.

The accounts for the past year show a profit of £8,610, to which is added £1,676 brought forward, making £10,286. It is proposed to transfer £5,000 to depreciation account and to pay a dividend of 6 per cent. on the preference shares, leaving £486 to be carried forward. The first section of the trolley 'bus system was opened last month, and the work of conversion on various sections of the tramway system is being

proceeded with; each section will be put into operation as it is completed. The capital for the conversion was obtained by the issue of £130,000 of 7 per cent. redeemable secured (registered) notes. Meeting: May 15th.

New Issues.

Hungarian Trans-Danubian Electrical Co., Ltd.—On Tuesday last the Whitehall Trust, Ltd., offered, at 93 per cent., £2,300,000 of 6½ per cent. "B" debenture stock of this company. The proceeds of this, together with an issue of "A" debenture stock with a Trade Facilities Act guarantee, are to be employed in the erection of a power station and transmission system in Hungary in connection with the supply to the electrified portion of the Hungarian State Railways; power will also be sold in bulk for other purposes.

The "A" debenture issue was advertised on Wednesday last. It comprised £1,000,000 of 4½ per cent. stock, at the price of £97 per cent., guaranteed as to principal and interest by the British Government under the Trade Facilities Acts, 1921-26.

The lists for both issues were to close to-day (Friday) or before.

Further information on the subject appears under "Recent Contracts" in our "Business Notices" section.

Prospectus.

Thos. W. Ward, Ltd.—On Wednesday last this company published the prospectus of an issue of 125,000 5 per cent. (free of tax) second cumulative preference shares of £1 each, and 375,000 £1 ordinary shares at par. The company has an authorised share capital of £1,850,000, of which £1,300,145 has already been issued. £100,000 of the second preference shares is reserved for employés under special conditions, and £50,145 has been issued. The company carries on many different businesses, including that of mechanical and electrical engineers. During the past five years the ordinary dividend has ranged between 6¼ and 10 per cent., free of tax. The list opened yesterday (Thursday), and was to be closed to-morrow (Saturday) or earlier.

Pennsylvania Water and Power Co.

The revenue for 1927 amounted to $3,525,343 (an increase of $421,669) and the surplus to $1,533,353 (an increase of $96,623). Four quarterly dividends have been paid—two of 2 per cent. and two of 62½ cents per share; $243,143 has been transferred to renewals and replacements reserve; $100,000 to sinking fund reserve; and $200,000 to contingent fund; leaving $23,051 to be carried to surplus.

Sir William Arrol & Co., Ltd.

The result of operations during 1927 was a net profit of £54,095, as compared with a loss of £116,702 in 1926. Mention is made in the report of the reduction of the issued capital from £726,700 to £548,680 during the year and the cancellation of arrears of preference dividend. It is proposed to pay the dividend on the preference shares for the six months ended December 31st last.

Anglo-American Telegraph Co., Ltd.

The report for the year ended March 31st shows that a total ordinary dividend of £3 15s. per cent. has been paid on the ordinary stock, and one of £1 10s. per cent. on the deferred stock. These payments, together with the preference dividend and income tax, absorbed £262,500, equal to the rent paid by the Western Union Telegraph Co. Meeting: May 8th.

Telephone Co. of Pernambuco, Ltd.

The report for 1927 states that the operation of the manual system for 11 months and the automatic system for a month resulted in a working loss of £858, which is raised to £1,858 by the payment of the proportion of the 8 per cent. debenture interest chargeable to revenue.

Hydro-Electric Securities Corporation.

At the recent annual meeting, Capt. Alfred Loewenstein said that shortly the company would dispose of a capital of $57,000,000, the bulk of which was invested in the United States. It was hoped that the company would be able to pay a dividend on its common shares in the near future.

Metropolitan Carriage, Wagon and Finance Co., Ltd.

Consequent upon the recent changes in the directorate, Mr. T. L. Taylor has been appointed chairman, and Mr. A. Spencer vice-chairman of the company. Mr. Spencer is on the board of the Metropolitan-Vickers Electrical Co., Ltd.

Glenfield & Kennedy, Ltd.

A final dividend of 6 per cent. has been declared on the ordinary shares, making 10 per cent. for the year as for the previous year.

British Automobile Traction Co., Ltd.

Messrs. J. F. Heaton, R. J. Howley, and R. M. Tilling have been elected directors of this company (shortly to be known as Tilling & British Automobile Traction, Ltd.).

Siemens Bros. & Co., Ltd.

A final dividend of 5 per cent. has been declared on the ordinary shares, making 7½ per cent. for the year, as for 1926.

Wireless Telegraph Co. of South Africa, Ltd.

An initial (interim) dividend of 10 per cent. actual has been declared.

German Companies.

The *Electricity Company* (*late Schuckert*), Nuremberg, reports a net profit for 1927-28 of 4,640,000 marks, and a dividend at the rate of 8 per cent.

The report of the *Mix and Genest Co.* states that although the turnover in 1927 showed an increase, the orders from the public authorities declined, and sale prices were depressed. A foreign organisation was in course of development and a company had been formed in Brazil to establish a telephone exchange. Out of the net profits of 805,000 marks it is proposed to pay a dividend of 9 per cent. as in 1926. The capital is to be increased by the nominal amount of 6,500,000 marks in ordinary shares and by 75,000 marks in preference shares.

The *German Cable Works Co.*, Berlin, which for the first time for 25 years is unable to pay any dividend, states that the hopes entertained when the capital was doubled to 10,000,000 marks, were not justified. The net profit was 30,000 marks, as compared with 381,000 marks in 1926. The unsatisfactory results are attributed to unforeseen expenses in connection with an order for 222 km. of long-distance cable with Pupin coils. In the export market conditions were very difficult owing to keen international competition.

The directors of the *Voigt and Haeffner Co.*, Frankfort-on-Main, in recommending a dividend of 8 per cent. for 1927 as compared with 6 per cent. in the previous year, announce that the prospects are satisfactory.

The *Duisburg Cable Works Co.* is paying a dividend of 10 per cent. out of net profits of 860,000 marks for 1927, as compared with 8 per cent., and 649,000 marks in the preceding year, on the share capital of 7,200,000 marks.

The *United Aluminium Works Co.*, Lautawerk, which belongs to the German Reich, states that the demand was considerable in 1927, and the production was disposed of. After writing off 2,500,000 marks for depreciation as in 1926, the net profits of 4,560,000 marks permit of the payment of a dividend of 9 per cent., as against 8 per cent in 1926.

Austrian Companies.

The *Felten and Guilleaume Co.*, Vienna, reports that the production in 1927 was greater than in the previous year. Export prices were unsatisfactory, while social burdens and over-taxation prejudiced the working results. The net profit was 1,740,000 schillings, as compared with 1,370,000 sch. in 1926, and the dividend is increased from 9 to 11 per cent.

The report of the *A.E.G.-Union Co.*, Vienna, states that despite an increased turnover in 1927, there was no improvement in the conditions hampering the industry, the tariff being inadequate. The railway department was well but not remuneratively employed on locomotives for the Federal railways and the Vienna tramways, and a similar observation applied to the construction of power stations and lines. The accounts show a net profit of 460,000 sch., as against 370,000 sch. in 1926, and the dividend is increased from 5 to 6 per cent.

Belgian Company.

The report of the directors of the *Ateliers de Constructions Electriques de Charleroi* states that the activity of business induced many undertakings in 1927 to enlarge or modernise their installations, and the labour cost and the necessity for reducing the costs of production accentuated the general tendency towards the electrification of industry. The volume of the company's exports constantly increased. During the whole of the year all departments were regularly supplied with work, and the orders brought over into 1928 were satisfactory. The net profit was 20,555,000 fr., and the dividend is at the rate of 30 fr. per 250-fr. share.

Stocks and Shares.

MONDAY EVENING.

PRICE fluctuations that may reasonably be called dramatic, if not actually sensational, have occurred in a number of stocks and shares connected with American utility companies. The principal of these is a jump of about 70 points in a week, which has taken place in the price of International Holdings, a company formed some time ago in order to finance operations in Brazilian Traction and other well-known industrial shares. Closely allied with this is the Hydro-Electric Company, the shares in which have risen some 16 points during the past few days; and, besides these two, a number of material advances have occurred in the stocks of American utility companies which are known, though not familiarly, to the London market.

The air of speculative excitement fanned by these movements serves to keep speculation alive in other departments, and amongst purely electrical stocks and shares substantial rises in the cable issues and in Marconis stand out with especial prominence.

Home Rails and Trams.

While other stocks and shares have been going ahead, the market for Home Railway descriptions, including those for electrical issues, remains disappointingly dull. The traffics do nothing to encourage confidence. The ephemeral brightness

shed upon prices by the optimism aroused through the Budget proposals has given way to a more usual lassitude, and a refusal on the part of the public to look with favour on these issues. Metropolitans and Districts are both lower, but Underground Railways of London maintain their prices fairly well. There has been further inquiry directed towards the shares of the London tramway companies, without, however, any particular change in quotations being caused thereby.

Energetic Electricity Movements.

Another violent rise occurred in the ordinary shares of the Egham and Staines Electric Company, the price being rushed up to 42s. 6d. before any sort of reaction took place. It reverted to the neighbourhood of 40s. 6d., then revived to 44s. At the same time Midland Counties Electric were buoyant, and purchasers took the shares up to 33s. 6d. When the enthusiasm boiled over, to use the Stock Exchange phrase, the price reacted to 30s. 6d. Bournemouth and Poole jumped to £5 a share, on the announcement of the bonus distribution. This is one of the few cases, cynics remark, in which the announcement of the bonus had the effect of putting up the price of shares. In sympathy with the rise in Bournemouths, County of London Electric ordinary rose to 42s. 6d., from which there was a reaction to 40s. Metropolitan Electrics have been quiet on the week, and other issues in the Electricity Supply section show comparatively few changes. Westminsters are a sixpence better at 26s. 6d. No alteration occurred in Richmond (Surrey) Electrics on the meeting, but the latter is notable for the speech by the chairman, Sir Harry Renwick, who condemned the " campaign " for cheaper electricity.

The Bournemouth Bonus.

The Bournemouth and Poole Electricity Supply Company's proposal is to capitalise £360,000 of the reserve and to distribute this as a share-for-share bonus to the proprietors of the ordinary. The report contains a significant sentence to the effect that negotiations for an extension of the company's tenure are still proceeding. This deserves the close consideration of shareholders, who, not unnaturally, feel tempted to take advantage of the rise in the price of their property.

Midland Electric Corporation for Power Distribution are in demand, and the price has gained 2s. 6d., to 78s. 9d. Scottish Power advanced to 30s. 6d.

Dramatic Cable and Wireless Rises.

Rumours of amalgamation of interests between cable, wireless and beam systems became so insistent to-day, Monday, that the cable issues went ahead in extraordinary fashion. Eastern ordinary gained 27 points. Globes, Eastern Extensions and Westerns put on £2 to £2 15s. Marconis were the centre of furious dealings at the opening of the Stock Exchange at the beginning of the week. In a wild and excited market the price rose to 70s. Many thousands of shares changed hands in the first ten minutes. People who had bought Marconis lower down rushed in and took substantial profits, but the buying proved better than the selling, and the shares at 68s. 9d. show a gain of 5s. on the week. Early last January they were 42s. 6d.: in February they reached 71s. 3d., and now are within half-a-crown of the latter figure, being, it must be recalled, of the nominal value of 10s. each. After such truly astonishing movements in cable and wireless issues, it seems tame, not to say insipid, to quote fluctuations of shillings and sixpences in other stocks and shares.

Community of Interests.

The Metropolitan-Vickers and the British Thomson-Houston are negotiating for a close community of interests, and the Edison Swan Co. is named as being another company concerned in the negotiations. Interesting announcements were made at last week's meeting of the B.T.H. Company, and, on the strength of them, Metropolitan-Vickers rose 2s. 6d. to 32s. 6d. General Electric ordinary are rather harder at 36s. 6d. Johnson & Phillips remain dull at 43s. 9d. as a result of the cut in the dividend, but the expenditure of £55,000 on property account last year is explained by references to the necessity for organisation of output capacity on the most modern lines in order to achieve the best results.

Brazilian Traction Boom.

British Columbia Electric Railway stocks have ceased their pyrotechnics, and the " final " offers of 275 for the preferred, 315 for the deferred are at present unchanged; as, indeed, they seem likely to remain. Brazilian Tractions at 257½ are 11½ up, and have touched 263 within the last few business days. An offer of £2,300,000 Hungarian Trans-Danubian Electrical Company 6½ per cent. " B " debenture stock is being made at 93 this week. The advance prospectus gives particulars that make the issue look an attractive speculative investment. It is tolerably obvious that Hungarian undertakings must carry an element of risk.

Amongst cable manufacturing shares, the market disposition is a trifle heavy. British Insulated, Callenders and Henleys are easier. Telegraph Constructions continue dull. Enfields went back to 4¼. Of the engineering shares, Babcocks lost a few pence of their last week's rise. The rubber share list makes a firmer showing as a result of the commodity rallying to 9d. per lb.

Share List of Electrical Companies.

	Nom.	Dividend. 1926.	1927.	Price May 7, 1928.	Rise or fall.	Yield, p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£1	14†	15	97/6	+8/-	3 1 6
Brompton Ordinary	£1	8¾	—	25/6	—	5 9 10
Charing Cross Ordinary	£1	8½	8½	26/6	—	5 5 8
do. do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Chelsea	£1	8⅞	8⅞	26/6	—	5 5 8
City of London	£1	10	10	29/6	—	4 15 0
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Clyde Valley	£1	8	8	25/-	—	4 11 5
County of London	£1	7½	7½	40/-	—1/-	3 15 0
do. do. 6% Pref.	£1	6	6	23/-	—	5 4 4
Edmundsons' Ordinary	£1	10	—	67/6	—	2 19 2
do. 7% Pref.	£1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	£1	11	—	53/9	—1/16	4 0 0
Kensington Ordinary	£1	8	8	26 6	—	5 5 8
Lancs. Light and Power	£1	7½	—	31/-	+6d.	4 16 9
London Electric	£1	8½	8½	25/6	—	5 9 10
do. do. 6% Pref.	£5	6	6	5½	—	5 8 2
Metropolitan	£1	8	9	2 7/16	-1/16	3 13 9
do. 4½% Pref.	£1	4½	4½	17/6	—	5 2 10
Midland Counties	£1	6	6½	31/-	+2/-	4 3 10
Newcastle-on-Tyne Ordinary	£1	5	6	27/6	+1/16	4 6 8
do. 5% Pref.	£1	5	5	19/6	—	5 2 7
do. 7% Pref.	£1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	£10	6	6	10½	—	5 11 7
North Met. Elec. 6% Pref.	£1	6	6	23/-	—	5 4 4
St. James' and Pall Ma'l	£5	8	8	26/6	—	5 5 8
South London	£1	8½	8½	26/6	—	5 5 8
South Metropolitan Pref.	£1	7	7	1½	—	6 3 0
Urban Ordinary	£1	7	—	53/9	—	2 12 2
do. 6% Pref.	£1	6	6	1 7/16	—	5 13 0
Westminster Ordinary	£1	8½	8½	26/6	+6d.	5 5 8
Whitehall Elec. Invst. 7½% Pref.	£1	7½	7½	22/3	—	6 14 10
Yorkshire Elec.	£1	8	8	33/6	—	4 15 7
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	73	—	5 9 7
Metropolitan	,,	3	3	70	—1	4 5 9
do. District	,,	8½	4	74½	—1	5 7 5
Underground Electric	£1	1½	5	26/-	—	3 17 6
do. do. Income	Bonds	6	6	124	—1	4 16 9
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	99xd	—	6 1 8
do Def.	,,	1½	1½	24½	—	6 1 10
Automatic Telephone	£1	10	10	45/-	—	4 9 0
Chili Telephone	£5	6	—	7⅞	—	*3 18 8
Eastern Extension	£10	10	10	23½	+2½	*4 5 1
Eastern Tel. Ord.	Stock	10	10	240	+27½	*4 3 4
Globe Tel. and T. Ord.	£10	10	10	23½	+2	*4 5 1
do. do. Pref.	£10	6	6	11½	—	5 7 10
Great Northern Tel.	£10	20	—	39	—	5 0 0
Indo-European	£5	10	10	40	—	*5 0 0
Marconi	10/-	5	—	68/9	+5/-	0 14 6
Marconi-Marine	£1	8⅞	12½	47 6	+1/3	5 5 2
Oriental Telephone Ord.	£1	12	—	53 9	—	*4 9 3
United R. Plate Tel.	£5	8	8	11 3/4	+1/4	*3 11 3
Western Telegraph	£10	10	10	28	+2½	*4 7 0
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref.	£5	5½	5½	8½	—	7 4 8
do. do. 2nd Pref.	£5	6	6	9½	—	7 17 4
do. do. 5% Deb.	Stock	5	5	78½	—	6 7 5
British Electric Traction Def. Ord.	,,	—	—	520	—	... ...
do. do. 8% Pref. Ord.	,,	8	—	19½	—	6 8 6
Brazil Traction	£100	6	7	2 7½	+11½	*2 14 4
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	95½	—	5 4 9
do. do. Preferred	,,	6½	6½	273	—	*2 5 9
do. do. Deferred	,,	8	8	313	—	*2 10 6
do. do. Deb.	,,	4½	4½	87½	+3	4 17 2
London & Sub. Trac. 5% Pref.	£1	Nil	Nil	11 6	—	... ...
London United Tram Deb.	Stock	4	4	60½	—	6 13 0
Mexico Trams, 5% Bonds	—	5	5	90	—	5 11 0
Mexican Light Common	£100	Nil	Nil	94½	—	... ...
do. 7% Pref.	£100	Nil	7	81½	—	8 11 10
do. 1st Bonds	—	5	5	83½	—	5 19 9
Yorkshire (West Riding)	£1	Nil	Nil	7/6	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	£1	13	15	68/3	—6d.	*4 7 3
British Aluminium Ord.	£1	10	10	45/9	+9d.	*4 7 4
British Elec. Transformer Pref.	£1	7	7	18/-	—	7 15 7
British Insulated Ord.	£1	15	15	4¼	—1/16	3 14 0
Brush Ord.	£1	10	—	29/-	—	6 17 11
Callenders	£1	15	—	4½	—¼	3 10 9
do. 6½% Pref.	£1	6½	6½	23/-	—	5 9 5
Crompton Parkinson Pref. Ord.	£1	—	—	17/6	—	... ...
Edison-Swan	£1/-	10	10	10/-	—	4 0 0
do. 5% Deb.	Stock	5	5	90	—	5 11 0
Electric Construction	£1	7½	—	27/-	—	5 11 1
Enfield Cable Pref.	£1	7½	7½	26/3	—	5 14 8
English Electric	£1	Nil	Nil	8 3	+9d.	... ...
do. do. Pref.	£1	3	Nil	11/3	—	... ...
Gen. Elec. Pref.	£1	6½	6½	24/-	—	5 8 4
do. Ord.	£1	7½	—	36/6	+9d.	4 2 2
Henley	£1	25	—	5 7/16	—1/16	4 10 0
do. 4½% Pref.	£5	4½	4½	4½	—	5 6 0
India-Rubber	£1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	£1	12½	10	43/9	—	4 11 4
Met.-Vickers Ord.	£1	8	6	32 6	+1½	3 13 10
do. Pref.	£1	8	8	38	—	6 1 11
Siemens Ord.	£1	7½	—	28/-	—	5 7 4
Telegraph Construction	£2	10	10	26½	—	*4 10 11

* Dividends paid free of Income Tax.
† 4% of which was Tax Free.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A New Electric Cleaner.

The accompanying illustration, fig. 1, depicts a new electric vacuum cleaner which has lately been placed on the market by the EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4. The nozzle is 14 in. in length, and may be raised or lowered by a simple movement—an advantage where thick carpets are to be cleaned. The height of the casing containing the motor is less than 7 in., thus allowing the cleaner to be run under heavy furniture. A comfortable grip handle is equipped with a switch for easy starting and stopping. The bag is detachable at the lower end by a quarter-turn on a dust-proof bayonet lock. The motor is suitable for use on both a.c. and d.c. supplies, and is fitted with ball bearings.

Fig. 1.—New Vacuum Cleaner.

A Shop-window Floodlight.

A useful attention-compelling window-lighting appliance has been recently introduced by the BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1. This unit is, in effect, a miniature floodlight projector with an adjustable mounting which can be fixed to the ceiling, wall or floor. It gives a concentrated beam of light on that portion or feature of the display opposite the centre of the beam, and at the same time provides a lower intensity of illumination over the rest of the window. It is claimed to be particularly suitable for small shops where up-to-date lighting effects are required, at small expense, from a single adaptable unit. The device can be used to supplement an existing installation, or it can be employed alone. Where it is desired to produce colour effects, the unit can be fitted with a suitable attachment. The floodlight, fig. 2, is supplied in two sizes, suitable for 200- and 500-watt gasfilled lamps. Both sizes are complete with a universal fixing bracket, and are fitted with polished aluminium reflectors. Coloured front glasses in red, blue, green and amber can be supplied if required.

Fig. 2.—Shop-window Floodlight Fitting.

A New Intermediate Switch.

We have received from Messrs. A. P. LUNDBERG & SONS, LTD., 477 to 489, Liverpool Road, Holloway, N.7, a sample of their latest production, an intermediate switch intended for use where lamps are controlled from four different positions. The feature of the device is the minimum number of contacts employed, *viz.*, four pairs, arranged in two sets of arms so as to give two through series connections in each position, two up and down and two crosswise. The contact arms are all fixed rigidly in one unit or movement, which has a quick-make and -break action. The general design of the switch is of that of an ordinary tumbler switch.

A New Electric Safety Kettle.

A recent introduction of the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, is an automatic electric safety kettle in which no thermostats or fuses are incorporated, and with which there is no necessity to keep replaceable parts. The mechanism is very simple, and provides for the automatic ejection of the connector plug if the kettle is left to boil dry. The bottom of the kettle is slightly domed, so that when the water boils away beyond a certain level the temperature at the bottom rapidly rises and causes the metal to expand in an upward direction. This movement is utilised to release a spring plunger, which throws the connector from its socket. A similar but even more rapid action takes place if the kettle is switched on when quite empty. After refilling the kettle the cut-out mechanism is reset simply by re-inserting the plug. Figs. 3 and 4 show respectively the cut-out mechanism in the "on" and "off" positions.

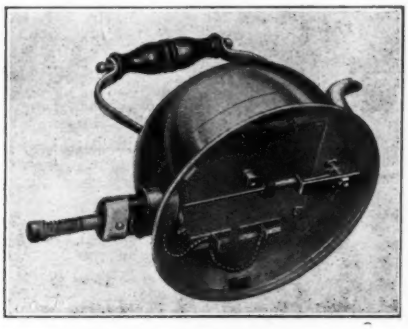


Fig. 3.—Cut-out Mechanism Set.

Fig. 4.—Spring-plunger Released.

A Multiple Electric Toaster.

The "Utility" multiple M.6 toaster, fig. 5, is a neat and attractive appliance by means of which several slices of bread can be toasted rapidly at the same time. It is supplied by MESSRS. ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10. The toaster contains six heating elements, suitable for rapidly toasting on both sides at the same time, five slices of bread. It is not necessary to employ the whole of the elements if fewer slices are wanted. The apparatus is provided with three switches, each controlling two elements.

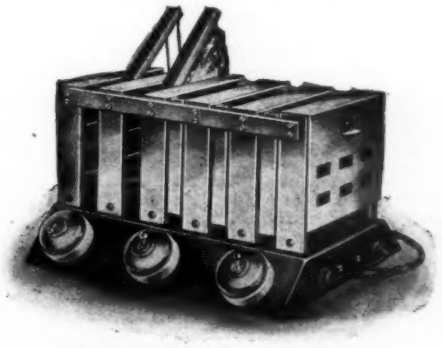


Fig. 5.—Multiple Electric Toaster.

The end reflector plates are movable and can be adjusted to ensure the maximum efficiency from the portion in use. The elements consist of mica-lined spirals, of best quality iron-free nickel-chrome wire, carried on porcelain strips which are supported in polished aluminium The base conceals all the wiring.

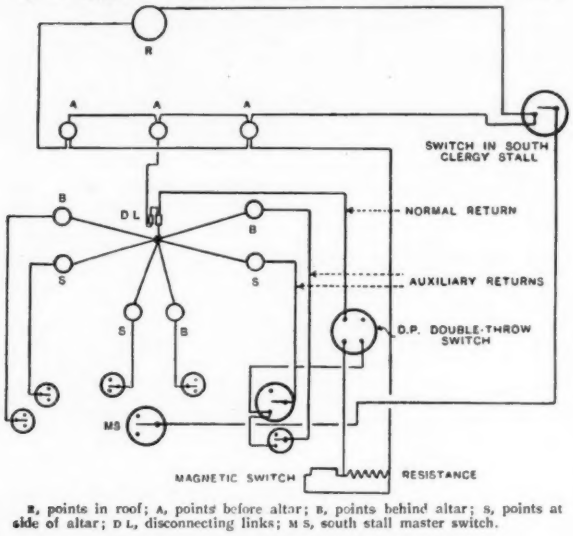
A Church Lighting Installation.

The scheme of electric lighting which has been put in at St. Michael's Church, Stonebridge, provides for unusual decorative effects.

WHAT is perhaps unique for its particular application is the electric lighting installation which has recently been completed at St. Michael's Church, Stonebridge. The scheme has been designed, not only for supplying artificial illumination, but also for the following purposes: To add to the beauties of the interior of the building in a new and interesting way; to permit instantaneous changes of lighting to be made during a service with ease and certainty; and to provide sufficient changes of effects to cover practically a lighting season, and to suit different kinds of services and varying periods of the year.

In the design care has been taken to keep down the number of points and the amount of material to the irreducible minimum, and to make it easy for anyone to obtain a reasonable light without any instruction.

The keynote of the installation is, of course, colour; pronounced colour is used in some cases, whilst in others there are merely tints, and many of the effects are entirely white. Some of the effects are obtained from indirect lights, but the majority are by direct lighting, whilst in the chancel and at the altar practically the whole of the points are concealed. There is a full gold light for the sanctuary and nave. There are some 116 points (fixed) representing a loading of 16.720 watts, while portable decoration lights on a series of flexibles for which a set of plugs are provided bring the total loading up to 20,280 W. The switching is so arranged that when



R, points in roof; A, points before altar; B, points behind altar; S, points at side of altar; D L, disconnecting links; M S, south stall master switch.

One of the Series-parallel Control Circuits.

decoration lights are connected, two final sub-circuits can only be switched on in series—an essential to a particular effect.

The maximum lighting at the various parts of the church, measured at the floor level, is as follows: Sanctuary, from 10 to 52 ft.-candles; chancel, from 21 to 35; centre aisle, from 27 to 36; and side aisles, from 21 to 28.

The actual illumination on the walls varies in a predetermined way in various parts of the building, as also does the tint. The building is in pale-yellow brick with sandstone columns, arches and facings, and so on. The tone and general effect of the maximum light is the product, of course, of all the principal full-voltage effects on at the same time, only two lighting points, apart from the font and chapel, being off, and the result is quite free from glare.

Where effect is produced by running all or part of the lamps not at their full brilliancy, the following methods of control have been adopted: Special forms of series-parallel circuits, of which there are three in the chancel and one in the nave, and four fixed-value resistances, one on each outer, with a corresponding one on each of the neutrals.

The series-parallel system is designed to be semi-automatic in order to simplify the switching and setting, and to reduce the chances of errors and oversight to a minimum. One of the series-parallel circuits in the chancel is designed to provide 14 combinations with some or all of the lamps dimmed, and 12 when they are running at full brilliancy. The accompanying diagram shows the arrangement of one of the series parallel circuits. In combination with lights on one or other of the two remaining series-parallel circuits in the chancel it contributes to 33 further effects.

Energy is supplied over three wires at 480 V between the outers. The distribution is effected from two switchboards, each equipped with five bus-bars. Four of the bus-bars are remotely controlled, the remaining one serving for various detail lights in such places as the vestries, porches, stokehold and pulpit. The lights embraced in the remote-control system can be supplied from two or more sets of bus-bars by means of two- and three-way switching arrangements, and by this means it is possible to pre-set four effects which can afterwards be switched on and off in any order, or all together, as required, by means of sets of five push-buttons arranged at three different points in the church. There are nine air-break remote control switches, seven being single-pole, and two double-pole. Six of the single-pole switches normally work in pairs (one on each outer) controlled by one button for both on and another for both off. The seventh switch opens or closes the operating coil feed of each of the three positive switches of the above pairs, rendering only one of each pair operative. This is necessary on those occasions when only a portion of a given lighting effect is required. The switch is opened or closed from the control points as required. Of the two double-pole switches, one is on both outers and the other between one return bus-bar on both boards and the corresponding ironclad main switch. Each pole of this last switch shunts one of the fixed resistances previously mentioned, and the returns from nearly half the lamps are permanently connected to the bus-bar concerned.

The normal procedure is to set at any time before a service the effects that are required, when they can be switched on for a moment for checking purposes. Thereafter they are ready to be switched on by push-button when required, without error or uncertainty and with complete silence. Although four independent effects can thus be pre-set, usually five would be available, as more than forty effects are combinations of two lesser ones, *i.e.*, two switched on at once.

Attached to the projector lantern with which the church is equipped is a small panel on which are two push buttons. Pressing one of these buttons extinguishes the church lights and illuminates the lantern projector lamp, while similar operation of the other button reverses the procedure.

A total illumination of 3,300 W from the altar is all that is necessary during a sermon or assembly, except the pulpit light and a set of lights in each side aisle in series dim.

The chapel installation is particularly effective; the points here are located so as to direct the light in special ways with regard to the altar, and so on. The general effect, roughly, is a soft gold light from a plane approximately 5 ft. above the floor level and upwards, with an ample white reading light below that point. In addition, an effect of warmth is created by the judicious use of small coloured panels in the fittings. The pulpit light is somewhat suggestive of a strong moonlight beam shining down on the pulpit from a high Gothic window or other tracery. It consists of an irregularly shaped double white beam directed at an acute angle from a point close up to the centre of the roof of the centre aisle. The centre of the field of the beam is white, merging to a gold tint at the edge.

The centre aisle lights, except three, are suspended close to the centre of the roof, and in effect are floodlights. There are 16 of these lights arranged in four groups. Each set of lights is fixed to a specially designed cradle having a simple balancing adjustment, and the cradles can be lowered to the floor level from a point at the back of the church.

The switch panels are arranged so that they can be operated by hand after two conspicuous buttons have been pressed. Three different sets of full-reading lights can be set on the switchboards and left locked.

Practically all of the fittings were specially designed along very economical lines, without sacrifice of quality or appearance or decoration.

The maximum load on the installation is not sustained beyond five or ten minutes at each service, except on unusual occasions. The average evening load is from 4 to 10 kW, covering a lighting period of two hours.

The supply authorities in the Willesden area allowed an out-of-balance of 2½ kW, and this is not exceeded in any of the designed effects. Only in four cases does it exceed 2 kW, while in fifty cases it is 1 kW or under.

Proposed Revival of Earl's Court Exhibition.

Mr. Douglas Hacking, Secretary to the Department of Overseas Trade, stated last week that his Department was in close touch with the Underground Electric Railway Co. in connection with a scheme for the construction of large new buildings at Earl's Court. He said that it was hoped that the new buildings would be ready for the British Industries Fair of 1931. The following day Lord Ashfield announced that the projected exhibition building would be the largest of its kind in London. From a traffic point of view, he said, the position had no rival.

The Combustion of Coal.

The author reviews the past development, the present position, and the trend of progress as applying to pulverised-fuel firing and stoker firing.

By F. H. ROSENCRANTS, B.Sc., A.S.M.E.

(*Abstract of Paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

IT has been during the last four years that by far the larger number of pulverised-fuel fired boiler installations now operating have been built. Experience accumulated slowly during the first few years, and the knowledge gained thereby was shared by but a very limited number of engineers of position and influence. Only during the last two or three years has the accumulation of knowledge born of experience become sufficiently diffused to enable any considerable body of competent thought to be brought to bear on the problem. The same period, in consequence, has given rise to a large volume of ideas—sound and otherwise—for the improvement of pulverised-fuel equipment and plant design.

Authentic gross efficiencies of 87 to 89 per cent. are being obtained in several instances, a figure which leaves but little room for improvement. There is still ample scope, however, for inventive genius in connection with refinements in design of equipment and plant layout, with the object of rendering plants more reliable and less costly to construct, operate, and maintain.

The problems confronted are different in different countries as a result of the rather wide variation in coal characteristics. In the United States the large majority of plants utilise coals of high heat value, having a high volatile, low ash, and low moisture contents. In Germany a large proportion of the coals utilised for steaming purposes are low in volatile matter, in addition to which the problem of handling lignite is receiving a great deal of attention. In England the harder quality and the high ash and moisture contents of a large proportion of the coals utilised present problems for special consideration.

The position of pulverised-fuel firing in relation to stoker firing continues debatable and unstable. The efficiencies and flexibility attained with pulverised fuel from the first have been a source of inspiration to stoker designers, with the result that big strides have been made in the improvement of this class of combustion equipment. Engineers are rapidly realising, however, that the stoker has been perfected to such a point that it is finding its old furnace inadequate. When engineers were content to burn 20 to 25 lb. of coal per sq. ft. of grate with cold air supplied in sufficient excess to give a CO_2 content of 9 to 11 per cent., furnace walls, arches, and grates gave but little cause for concern. Present-day conditions, however, arising out of the rapid increase in capacity, and in the rate of evaporation; the growing popularity of flue-gas air preheaters resulting from the practice of feed-water heating with steam extracted from the main turbine; and the demand for the highest attainable efficiency, require combustion rates of 40 to 50 lb. of coal per sq. ft. with air supplied under forced draught at a temperature of anything up to 550 deg. F. and with the excess reduced to a point represented by a CO_2 content in the furnace of 13 to 16 per cent. The result is furnace troubles, which at the moment are becoming acute. Furnace maintenance expressed in pence per ton of coal fired has, in one instance, reached the prohibitive figure of 48d., and in several other instances it is known to have exceeded 24d. What is more serious than the cost of repairs is the frequency with which the service of the boiler unit is made unavailable through the necessity of furnace repairs. In the solution of the problem, water-cooling of the refractories as applying both to side and rear walls and to arches is receiving the consideration of engineers.

In the United States many boilers are now equipped with water-cooled walls, and practically all of the larger installations under construction include water-cooling. It is a development which is sure to make progress—and with an accelerated pace. It must be practised with discretion, however, as it is possible to overdo the job, especially with chain-grate stokers.

Small boilers should be equipped with stokers, and large boilers with pulverised fuel. The greater the number of boilers involved, the stronger is the position for pulverised fuel, and *vice versa*. Circumstances such as coal characteristics, coal cost, load factor, &c., alter cases, however, and at the present time he would be bold indeed who would attempt to draw closely the line limiting the field of either.

Systems of Pulverised-fuel Firing.

Two systems as applied to boiler plants have become well established, namely:—

(1) The bin-and-feeder system (sometimes referred to as the central grinding system), and

(2) The direct-fired system (sometimes referred to as the unit system).

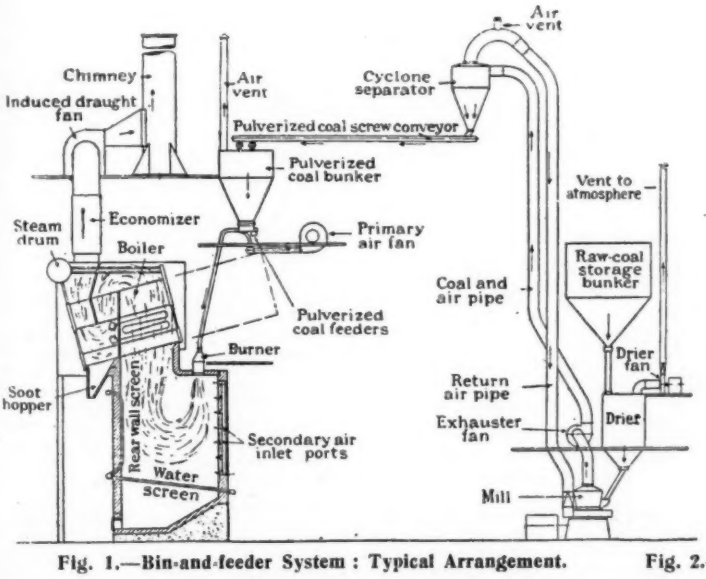


Fig. 1.—Bin-and-feeder System: Typical Arrangement.

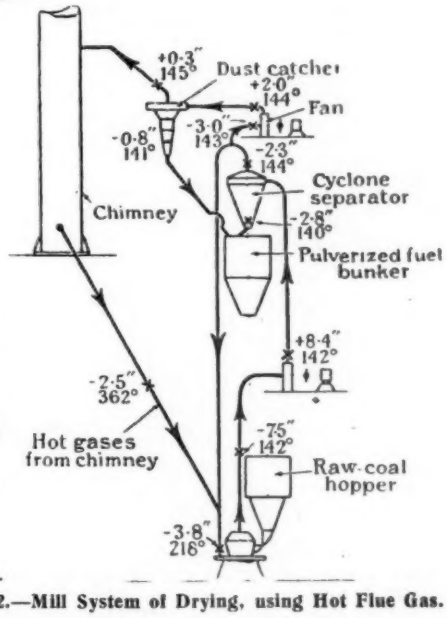


Fig. 2.—Mill System of Drying, using Hot Flue Gas.

The bin-and-feeder system is characterised by a pulveriser or pulverisers which deliver their product to a pulverised-coal storage bin, from which, through the medium of suitable feeders, a regulated supply of coal is fed to the furnace through burners so applied as to proportion and mix the coal with the required air for combustion.

The direct-fired system is characterised by a pulveriser or pulverisers which, supplied with a regulated feed of raw or coarse coal, deliver the pulverised product direct to the furnace through suitable burners. An arrangement of plant typical of many now operating is indicated in fig. 1.

To utilise wet coal successfully, it becomes necessary to dry it to a point such that it may be successfully handled through the various elements of the system. To the extent that we so design equipment that it will handle wet fuel, we lessen the necessity for drying. Our ultimate object should be so to perfect the equipment that no drying is necessary. Theoretically, no heat loss results from the drying process. The moisture which is in the coal as received must be evaporated either in a drier or in the furnace, and approximately the same amount of heat will be required in either case.

Actually, a loss of heat is usually associated with drying prior to feeding the coal to the furnace, owing to the inefficient means of applying heat in driers as compared with the efficiency of heat application in the furnace. However, it is important that we do not get a distorted view of magnitude by failing to consider the amount of heat which would be absorbed in the furnace by the moisture in the coal if it were not removed by pre-drying.

Two forms of moisture are recognised, commonly designated as free moisture and inherent or hygroscopic moisture. It is well established that the harmful influence of moisture on the behaviour of coal in the various elements of a pulverised-fuel plant may be almost wholly charged to free moisture. The moisture content of a coal expressed as a total gives no indication as to the necessity for drying or the extent of drying required. Some high-grade bituminous coals carrying as much as 6 to 8 per cent. of total moisture may require drying, whilst there are deposits of lignite which may be handled with complete satisfaction with as much as 30 per cent. moisture.

Until a very few years ago, the best-known form of drier was the horizontal indirect-fired rotary drier, of which there are many in service. Unfortunately, however, it is handicapped by disadvantages such that it has never become popular for power-station practice. It was early recognised that a vertical form of drier through which the coal would flow by gravity in response to mill demand was most desirable.

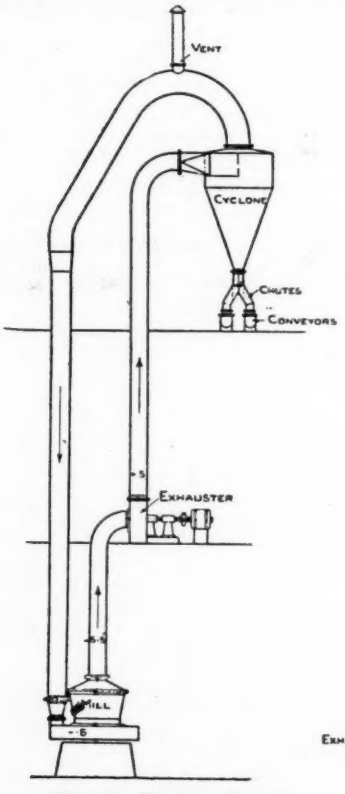


Fig. 3.—Obsolete System of Mill Piping.

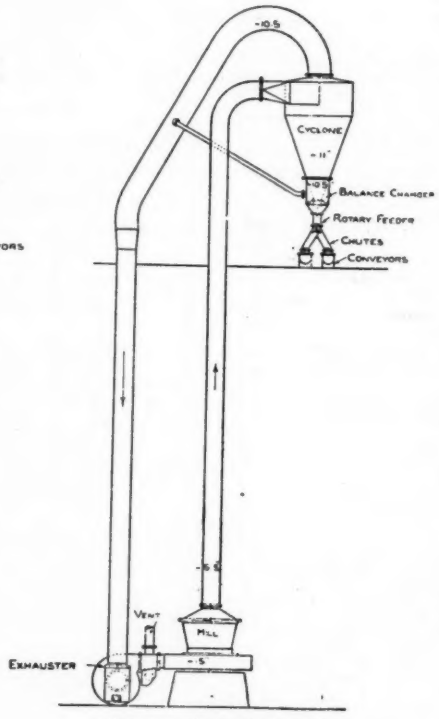


Fig. 4.—Up-to-date System of Mill Piping.

Though a considerable number of driers of this description have been installed and are operating, their history is not a happy one.

Recent efforts have been devoted to the development of steam-heated driers retaining the advantage of gravity flow but supplementing it with positive propelling equipment for ensuring a uniform flow of coal through the unit. A further advantage is that the air circulation for carrying away the vapour does not pass through the coal, with the result that the dust nuisance present with the previous forms is diminished to the point of elimination. The functioning of this form of unit promises well for its complete success. It has the disadvantage, however, of being expensive.

We may say with confidence that the drying problem is on the eve of solution. We may also say that the steady progress in the design of other elements of the system, by virtue of which the moisture limit with which the system will deal satisfactorily is raised, is such that it now appears that by about the time when driers are perfected they will be no longer required in other than exceptional cases.

Drying by means of the admission of hot air or gas into the pulveriser circuit involves the admission of hot air from the air preheater or flue gas from the boiler outlet into the return air circuit just before it enters the pulveriser. The intimacy of contact between the air or gas and the coal in the mill results in very rapid drying. Air or gas admitted into the mill must be taken out at some other point; this is the disadvantage of the system. If hot air is used, with proper precautions it may be blown into the furnace. If flue gas is used, it may be discharged to the furnace or the chimney. Fig. 2 is a diagram of an actual installation using flue gas for drying, with test values of temperature in degrees F. and of pressures (plus or minus) in inches of water at various points in the system. The following set of figures applies to the same test:—

Duration of test	3 hrs. 20 mins.
Throughput	4.29 tons per hr.
Quantity of gases entering mill ...	9,930 cu. ft. per min.
Quantity of hot gases admitted ...	4,500 cu. ft. per min.
Raw coal. Moisture—	
Free, per cent.	4.11
Hygroscopic	5.33
Pulverised coal. Moisture—	
Free, per cent.	0.00
Hygroscopic	4.92
Removed	4.52

The pulverisation of coal has been well established in the cement industry for many years. The large majority of installations used pulverisers of the screen separation type, but air separation is adopted by all leading manufacturers of pulverising equipment as applied with the bin-and-feeder system. The arrangement of plant shown in figs. 1 and 3 is typical of the large majority of plants operating on this system to-day. The air flows in a closed circuit, the only interchange of air taking place being that which leaks into those parts under vacuum and displaces a corresponding amount which escapes through the vent. The chief source of leakage is through the coal feed; the total leakage, however, is but a small volume per minute.

Separation of the finished product from material in process is brought about by the air current which, entering the grinding chamber through a series of openings extending completely round it, passes up through the coal in process and carries away the finished product in suspension. The mixture of coal and air leaves the pipe connected to the top of the pulveriser and passes through the exhauster and on to the cyclone separator, from which the coal dust is discharged at the bottom. The air returns to the pulveriser, thus completing the circuit. Pulverisers of this general description are essentially constant-load machines. As normally operated, the pulveriser and exhauster speeds are kept constant, and the coal feed is adjusted to give maximum output.

Ball mills of the conical or tubular type have thus far not become popular for pulverising coal. The inherent inability of this type of mill to handle moisture is perhaps the chief cause, though the noise associated with their operation is also a contributing factor. The energy consumption per ton of coal pulverised is not prohibitive, though high, and the maintenance cost is lower than for any other type. For hard, abrasive fuel, such as anthracite coal or coke, they are superior to all other pulverisers.

Wear is intimately associated with the pulverisation of coal, and varies widely with the character of the coal and its ash content. Chilled cast iron, heat-treated alloy steel, and manganese steel thus far have proved to be the best materials for those parts subjected to intense wear, and ordinary mild steel of suitable thickness for those parts, such as straight pipes, &c., which are subjected to wear of less intensity. Pipe-bends between the mill and cyclone should be avoided wherever possible, but, where necessary, should be made of cast iron, heavy-gauge plate, or steel pipe cement-lined. Cyclones should be lined throughout with renewable plates or cement. Exhausters should be on the air side of the circuit to avoid the severe wear on the impeller which takes place when the exhauster handles the mixture of coal and air with the plant arranged as in fig. 3. Fig. 4 is a modified arrangement with the exhauster properly located, and is typical of the arrangement adopted by the author for all plants designed since early in 1926.

The arrangement shown in fig. 4 places all parts of the system, except the short length of pipe between the exhauster and the mill, under a pressure below that of the surrounding atmosphere, with the result that any leak which takes place admits air into the system, and this air ultimately finds its way out through the vent rather than permit coal-laden air to be discharged into the pulverising room. It allows advan-

tage to be taken of the centrifugal separation of coal dust and air which takes place in the exhauster in providing a coal-free air at the vent. By virtue of the energy delivered to the exhauster, approximately 50 per cent. of which is converted into heat and delivered to the air handled, the temperature of the return air is raised and the trouble from condensation minimised.

Condensation of moisture in the pulveriser circuit is a source of annoyance, the prevention of which merits consideration. The air circulating in the mill system becomes almost immediately saturated with moisture absorbed from the coal, the actual amount taken up being influenced by the rise in temperature resulting from the pulverising effort. The temperature is highest at the mill outlet (or at the exhauster outlet if the system is arranged as in fig. 3). From this point on, cooling takes place by radiation. Immediately the temperature in the system falls below the dew point, precipitation of moisture occurs.

To insulate the entire system serves no useful purpose. We may, however, with advantage, insulate the return air pipe from cyclone to mill, leaving the rest of the system bare to radiate the heat received at the minimum possible temperature. As a result, the temperature of the system is raised but little above that of an entirely uninsulated system; the insulation on the return air pipe effectively limits temperature reduction to a minimum, and condensation and its consequent annoyance is largely, if not wholly, eliminated. If operated on the open system, the whole of it should be insulated, as the heat received will be carried away by the constant circulation of air into and out of the system.

Having correctly installed the pulverising units, their proper operation is of prime importance in securing low energy consumption, high output, and long life of wearing parts. The most important factor in this respect is to keep the pulveriser properly loaded. Underloading is an all too frequent offence. The differential draught as measured between mill inlet and outlet by a water gauge gives the proper indication of loading, since it shows the resistance of the coal bed in the mill to air flow. A fixed reading of this gauge indicates a definite amount of coal in the pulveriser. Hand control of the mill feed is a possibility, but automatic control governed by the differential draught across the pulveriser should form a part of every pulverising unit.

Transport systems for pulverised fuel are of two general classes, namely, air transport and mechanical transport. Two forms of air transport, both using compressed air as the carrying and propelling medium, are in use, namely, the intermittent or "shooting" system and the continuous "pump" system. For power-station service the shooting system is but little used.

The continuous or pump system consists essentially of a long spiral driven at high speed in a cast-iron cylinder or barrel communicating at one end with a source of pulverised fuel and discharging at the other end into a pipe line connecting with a distant bin at the point of consumption. The screw or spiral acts as a feeder, and at the same time as a seal to prevent the backward flow of compressed air injected into the coal at the point where it leaves the screw and enters the pipe line. Coal may be delivered by this system to any reasonable distance and height. Distances up to 2,000 ft. and heights of over 100 ft., have been dealt with successfully. There are many examples of this system in operation, but with the increasing tendency to arrange the mills in close association with the boiler units, it seems probable that its use will decrease.

Properly designed and constructed, the screw conveyor is the most satisfactory form of transport. Conveyors of this class are normally installed horizontally, though they will function satisfactorily for delivering coal up a moderate incline.

(To be continued.)

Discussion in London.

Mr. R. A. CHATTOCK, in opening the discussion, said he quite agreed that for small boilers stoker firing was best, but nowadays, with the larger plants in vogue, it was necessary to use some sort of pulverised-fuel or liquid-fuel firing in order to obtain adequate cost for pulverised-fuel plant could be justified. His experience led him to favour the direct-firing method against the bin-and-feeder system. He had found that with the enclosed conveyor the moisture which was left in the conveyor combined with the coal, and resulted in clogging. Referring to the author's criticisms of the direct-firing system, he said that by aiming at driving at full load and not light load the power consumption could be kept down to that of the bin-and-feeder system; it should not be necessary to have coarse fuel at full load—the mill could be designed to give the proper fineness; if the unit choked and ceased to function, as suggested, then the design and lay-out of the plant were wrong; the question of wear applied to both types of mill; breakdown could be provided against by interchanging. He did not see why a lower efficiency should result from some of the burners being idle—air could be passed through the idle burners. The unit system cost only half of the bin-and-feeder system, but there was a doubt about the operating costs being less; at any rate, there was a reduction on the ordinary operating costs. The difficulties were not so great in America as in this country, because the ash and moisture contents were not so great.

Mr. W. M. SELVEY said that his experience had shown that bunching of the coal did not occur when the fuel was kept hot. The proper place for the "surplus" to be sent was back to the pulveriser. By means of a blackboard sketch he explained a new conception of the mixture necessary for perfect combustion. This required certain quantities of coal, air and combined products, and was, he suggested, the basis for ideal combustion. Referring to the turbulence problem, he explained that around the particle of suspended fuel was a film of C—CO_2, if the particle itself was made to spin, the film could be got rid of to some extent. He thought there was a danger to-day of forgetting the original purpose of the arch in the ordinary stoker furnace. The main object of lengthening the arch was to mix all the gases from the various stages of combustion along the grate and create as much turbulence as possible. The short arch might get over the present difficulties, but not without turbulence. He had found it successful with Northumberland coal, but with Midland coal there was an enormous liberation of volatiles and no possible chance of turbulence. The chain stoker would meet the first sudden increase of load, but not a repetition of the increase ten minutes later.

Capt. J. M. DONALDSON claimed considerable success for six large installations designed partly on the bin-and-feeder and partly on the unit systems. Not one of the six would he replace exactly if the occasion for replacement arose. It should not be difficult to keep up a steady high efficiency. In one case a sudden increase of 5,000 or 6,000 kW on a normal loading of 15,000 kW was met successfully—he thought there would have been trouble had the boilers been equipped with ordinary stokers. In another instance 18,000 lb. evaporation was obtained from a boiler which would have ordinarily given 6,000 lb. Where pulverised-fuel boilers were working in conjunction with stoker-fired boilers he had found that the former easily took the peak loads, leaving the others with steady loadings. In some power stations in America there was no attempt at drying the coal. In this country we had to use slack, which had a great capacity for moisture. He disliked the flat arch, and thought that the best system would embody some modified form of the bin-and-feeder method. Care should be taken to get the preheated natural air back into the furnace.

Mr. J. H. LAKE said that at Derby they easily maintained an efficiency of from 86 to 87 per cent. One great advantage of the pulverised-fuel system was its ready adaptability to oil firing. The total energy consumption per ton of fuel fired was 22.3 kWh, or 1.7 per cent. of the total heat in the coal. On trial the plant at Derby had maintained a load of 3,300 kW, with coal of 9,930 B.th.u. The maintenance costs had proved extremely low, and over a period of 14 months had amounted to only 8d. per ton. He had found that coal passed through a ¼-in. mesh resulted in lower pulverising costs. The fuel costs for last year amounted to .108d. per kWh generated, and there was about 30 or 40 per cent. of stoker-fired plant. For April this year the cost was .086d., and this also included some stoker firing. There were two Raymond mills at Derby; one had dealt with 16,000 tons and the other 18,000 tons.

Mr. H. A. NEVILL said that at Peterborough they had had good experience with the unit system. He had endeavoured to get the moisture content down to 2 per cent., but the fuel rapidly absorbed oxygen, which led to spontaneous combustion. It was necessary for the temperature of the coal leaving the driers to be 260 deg. F. On the Continent he had seen a 2 per cent. moisture content obtained at a temperature of 120 deg. F. The velocity of the coal and air at the burner at Peterborough had to be 60 ft. per sec.; on the Continent velocities of 25 and 36 ft. per sec. were working satisfactorily. If a plant could be designed which would permit all the burners to be in use all the time it would prove a distinct advantage.

Mr. C. M. SHAW said that he obtained 60,000 lb. out of a boiler designed for 27,000 lb. by means of special burners and water-cooled walls. He stressed the necessity of not relying on the prime mover for power to drive the pulverising plant.

In a brief reply, Mr. ROSENCRANTS agreed that generally the unit system was cheaper, but cases had been put forward where the bin-and-feeder equipment cost was lower. His experience was that the correct mixture could not be maintained with some of the burners shut down. He thought that the moisture trouble was the result of condensation, and to prevent this thorough insulation of the bin was advocated; this also protected the metal against corrosion. A difficulty with the drying was to raise the air above 120 deg. F. He was convinced that the great majority of the burner troubles were due to the uneven distribution of the particles of coal around the periphery of the furnace.

A Chadwick Lecture.

On May 15th, a Chadwick Lecture will be given by Major Walter Elliot, M.P., on "Sunlight—Natural and Manufactured, and Its Use in Modern Medicine," in the Hastings Hall, British Medical Association, Tavistock Square, W.C., at 8 p.m. The lecturer will review some of the recent research work and discuss the experiences of certain local authorities.

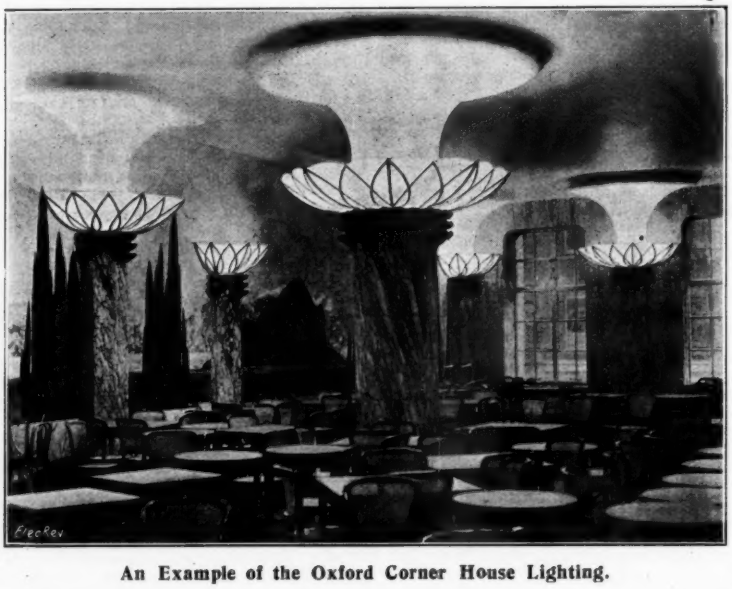
The Oxford Corner House.

Particulars of the Electrical Equipment at the New Corner House of Messrs. J. Lyons & Co., Ltd.

ANOTHER of the luxurious Corner Houses of Messrs. J. Lyons & Co., Ltd., was opened in Oxford Street, London, on the site of the old Oxford Music Hall, last week. In keeping with the advances which have been made in the general layout of the building, which has a total seating capacity of 2,500, some new features are to be found in connection with the electrical equipment. The whole of the installation for lighting, power, signalling, and so on, has been carried out by Messrs. Lyons's Electrical Department.

With the exception of the lighting the whole of the electrical work may be summed up in the word "simplicity."

Two supplies are taken from the St. Marylebone electricity undertaking, one a.c., 3-phase, 240-415 V, and one d.c., 480-240 V, in addition to a secondary supply from the St. Pancras undertaking in order to comply with the L.C.C. regulations. The two main supplies are taken in at separate switch rooms, where the main ironclad-type switchgear is mounted on simple angle-iron frameworks; these were constructed on the job. Each 3-phase switch unit is equipped with an indicator showing the destination of each phase lead and the state of the main fuses, *i.e.*, whether blown or not. The a.c. supply takes the bulk of the load and the d.c. connection serves for various small motors. There are in all some 4,000 lighting points, representing a total loading of about 250 kW, while over 200 motors, ranging from 1/16th to 30 h.p., account for somewhere about the same amount of power. The wiring, from the heavy cables from the main switchboards to the small lighting-circuit wires, is all run in screwed tubing, and a feature is that all the tubes are kept well clear of the walls by spacing clamps. An unusual point is that the supply is balanced separately on each floor.



An Example of the Oxford Corner House Lighting.

The larger motors serve for driving an elaborate system of elevators and "de-elevators" between the kitchens and service departments on different floors. These are equipped with push-button control for stopping in the case of emergency, but they can only be started again by means of a special key. Automatic throw-offs are provided at the required ends of the conveyors for the transported trays, and so on, and specially designed Igranic automatic cutouts disconnect the supply in the event of a jam on the equipment. In conjunction with the conveying equipment there is installed a system of signalling for communicating what is required to be sent from one department to another, and also what is being dispatched. This apparatus is arranged on the lines of the ordinary bell-indicating system, except that the actual indicators are duplicated, one at each end, and arranged with 2-way switching. The system operates at 12 V and is fed from a transformer off the main supply.

There is also an electrically-driven turntable in the service department, which works in conjunction with dish-washing apparatus and conveys the various articles from the elevator to the "de-elevator."

In addition to a large main refrigeration plant there are some 30 small Frigidaire sets scattered about the building. Among the other electrically operated equipment to be seen on the premises are goods lifts supplied by the Express Lift Co., Ltd., and passenger and service lifts provided by Messrs. Waygood-Otis, Ltd., while the building is also equipped with a system of electric time clocks supplied by the Magneta Time Co., Ltd.

As indicated in the accompanying illustration, the electric lighting installation strikes an entirely new note in restaurant lighting. The chief features of this unique scheme are the wonderful isolated marble pylons supporting lighting units of lotus flower design, eight feet in diameter. Each fitting accommodates 24 100-watt Pearl Osram lamps. The major and minor wall pylon fittings are of similar design and vary from 3 ft. 2 in. to 6 ft. 8 in. in diameter. These are fitted with Osram flame-tinted colour-sprayed lamps. All are glazed with a special form of diamond rain-drop glass with flesh-colour relief, the metal-work being in gold and silver gilt finish. Another unique feature is the fact that the ventilation system is combined with these fittings; the louvres at the base form a screen to conceal the ducts. For the minor lighting points clear lamps are used.

In addition to supplying all the electric wires and cables, steel-barrel conduit, and a number of high speed, self-levelling Express goods lifts, the General Electric Co., Ltd., also manufactured and supplied the whole of the decorative electric lighting units for the public rooms and staircases, to the designs of, and in collaboration with, Mr. Oliver P. Bernard, the artist responsible for the decoration scheme.

The Japanese Electrical Market.

Relations between Native and Foreign Concerns.

IN the annual review of the *Japan Advertiser* there appears an account of the relations existing between certain European and American engineering concerns on the one hand and Japanese enterprises on the other. The principal foreign companies operating in the Japanese electrical machinery market are, it is stated, the International General Electric Company, the Westinghouse Electric Company of Japan, the English Electric Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and the Siemens-Schuckert Electric Company. In addition, there are several Japanese companies operating under foreign supervision or in which foreign capital has been invested. The General Electric Company and the Mitsui Gomei Kaisha are described as joint proprietors of the Shibaura Engineering Works and the first-named is interested in a Tokio lamp and lighting fixture works. The Mitsubishi Engineering Company is licensee for Westinghouse products. At the same time the local manufacture of telephone equipment is controlled by the Western Electric Company, while the Fuji Electric Company is allied with the Siemens-Schuckert organisation.

The *Japan Advertiser* also describes the local selling arrangements of certain of the western organisations, stating that while the General Electric Company sells through the Mitsui Bussan Kaisha (the concern which is now forming a company jointly with Babcock & Wilcox), Metropolitan-Vickers through Taka and Company, and Siemens - Schuckert through the Fuji Denki, the English Electric and Westinghouse companies do their own distributing.

Our contemporary then proceeds to show to what extent Japanese electrical manufacturers are able to compete with foreign companies. At the outset it is admitted generally, but subject to certain exceptions, that if price governs the transaction the order will go to the Japanese market, while if quality is the leading factor one of the foreign concerns may get the contract. The foreign product is subject to a duty of 20 or 25 per cent.

By way of example, it is pointed out that foreigners obtained only two water-turbine generator contracts last year. As to turbines, the Imperial Government Railways bought one of European make and the Tokyo Electric Light Company one of American manufacture. No American surface condensers were sold. Orders for small transformers were all placed with local makers, but on the other hand, traction units, such as trolley cars and electric railway coaches, were all imported. Radio receiving sets are made locally.

Imports of switchboards keep up fairly well. The demand for vacuum cleaners, electric toasters and other cooking appliances, has not yet developed greatly. Most of the wiring materials and some of the conduit tubing used is made in Japan.

On the subject of comparative prices, the interesting statement is made that taking American electrical machinery at 100, British and Swiss sell between 85 and 95, German between 75 and 85, and Japanese between 40 and 60. Occasionally German, British, or Swiss makers are found competing in the price field with the Japanese, but on the whole these percentages hold good.

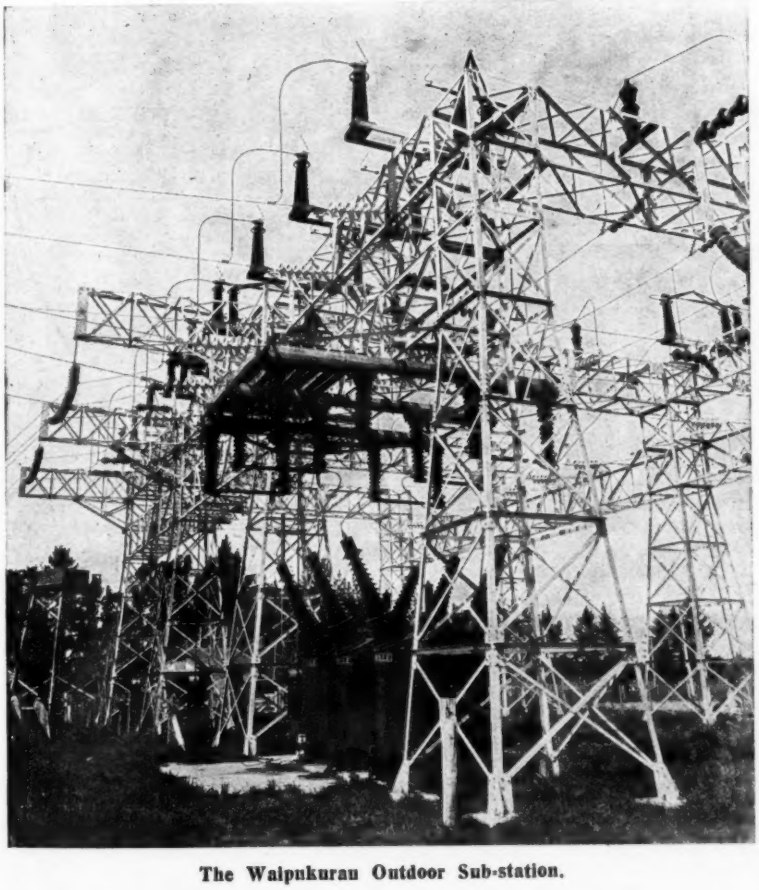
Some criticism of Japanese electrical manufacturers is offered, it being suggested that in their anxiety to obtain an order they will undercut without regard to actual costs of manufacture. "Often they have to 'trim the job' in order to limit their losses on such contracts. . . . Because of 'trimming the job' and hasty construction methods, Japanese electric machinery often fails to come up to specifications. Generators with a 10,000-kW rated capacity, produced by foreigners, are copied in detail, but fail to give more than 7,500 kW at maximum when completed. On the contrary, Japanese users rely greatly on the overload capacity of American products. Condensers rated at 400 amperes will be operated continually at 500 amperes. Steam turbines rated at 35,000 kW will be run up to 45,000 kW. In the Kawasaki Dockyard Company's sheet mill at Kobe, a generator is being operated at 100 per cent. overload from time to time. This tells on the life of the machine and is not economical."

Regarding future requirements, the view is expressed that owing to the recent industrial depression, there appears to be quite enough power for the needs of the next two or three years. On the other hand, general supply should be better, as more and more Japanese are using electricity in their homes. Rates for energy are still too high, however.

Outdoor Sub-station Switchgear.

Some notes on the high-pressure equipment supplied by Messrs. A. Reyrolle & Co., Ltd., for the Waipukurau Sub-station, New Zealand.

IN view of the rapid extension of overhead h.p. transmission systems and interlinking schemes all over the country, the supply of switchgear to meet the demands of modern large power stations is a matter of cardinal importance. The practice in many quarters of erecting transformers and switchgear in the open air has met with outstanding success, and complete outdoor sub-stations have proved, it is claimed, to be the most serviceable and economical form of construction; for although the outdoor equipment costs more than the corresponding indoor gear, the difference becomes less as the transmission voltage increases, and there is also a large saving in the cost of building.



The Waipukurau Outdoor Sub-station.

66,000 V is in vogue in several places in Great Britain, but only in one case, we believe, is the switchgear directly connected to the h.p. line; this is at the Stoney Cut sub-station of the Newcastle-upon-Tyne Electric Supply Co., Ltd., and its associated undertakings, where a tee-off is taken direct from the 66,000-V overhead line running between the North Tees and Dunston power stations.

The position overseas, however, is rather more advanced, as is evidenced by the following particulars of three of the chief sub-stations of the hydro-electric power development scheme of North Island, New Zealand, namely, Mangamaire, Dannevirke, and Waipukurau. These three sub-stations are more or less alike so far as their high-pressure switchgear is concerned (see ELECTRICAL REVIEW, April 30th, 1926, p. 695). They are connected to the 110,000-V transmission line that runs between the Khandallah and Lake Waikaremoana power stations, and are used to control branch lines for the supply of power to meet the local requirements, which are mostly for farming.

Each three-phase switch is operated as a whole by means of a motor connected to a composite horizontal shaft, which carries three pinions engaging with three racks for the operation of the circuit-breakers controlling the three phases. The circuit-breakers are connected to overhead pole-operated isolating switches, and above these again there are gang-operated disconnecting switches. The accompanying illustration is a general view of the equipment at the Waipukurau station. All the switchgear used in this installation, both on the 110,000- and on the 11,000-V sides, was manufactured by Messrs. A. Reyrolle & Co., Ltd. The 11,000-V side includes panels for the Power Board, as well as for the Public Works Department. The three-phase bank of circuit-breakers shown is of the "VO" 110,000-V type, and has a current-carrying capacity of 300 A. It is interesting to note that Messrs. Reyrolle also supplied the 66,000-V switchgear for the Stoney Cut sub-station already referred to.

Legal.

Instrument Screw Co., Ltd., v. Birkbys, Ltd.

IN the King's Bench Division, on May 2nd, Mr. Justice Rowlatt heard an action by the Instrument Screw Co., Ltd., South Harrow, against Messrs. Birkbys, Ltd., Liversedge, Yorks., claiming £960 which plaintiffs alleged was due to them under an agreement made between the parties on July 24th, 1926. Defendants denied liability.

Plaintiffs are manufacturers of screws and turned parts for electrical and scientific purposes, and licensees of the patent of the "Clix" pin radio valve legs. Mr. Rayner Goddard, K.C., said that under the agreement mentioned the defendants, who are electrical insulation manufacturers, were appointed sole selling agents for the "Clix" pins on terms that they paid to plaintiffs at the end of each year 12½ per cent. of the amount by which the net turnover of the pins fell short in a year of £8,000. The agreement provided that "It is understood that in the event of Patent 231,230 ('Clix' pin) being declared invalid or void by revocation, or that the valve legs shall become the subject of proved infringement the agreement shall cease." His Lordship was asked to construe that clause as meaning, as plaintiffs submitted, that there could only be an infringement if plaintiffs' valve legs infringed some other article. Defendants contended that it meant if another article infringed the "Clix" patent.

For the defendants, Mr. SCHILLER, K.C., said that about the time that the agreement was entered into the "Deltavis" pin was put on the market and the Comptroller of Patents having refused to revoke the "Deltavis" patent competition with the "Clix" was such that the sale of the latter had been negligible. That he submitted was a proved infringement within the meaning of the terms of the agreement. The owners of the "Clix" pin were Autoveyors, Ltd., radio engineers, and litigation between them and "Deltavis," a Swiss company, was still pending.

Giving judgment, his LORDSHIP said that the crux of the agreement was in the words "subject of proved infringe-

ment," and he could not imagine that by those words business people could have meant that if some person, perhaps trifling manufacturers, produced an article which infringed the patent that would put an end to the agreement. He accepted plaintiffs' interpretation of the agreement, and there would be judgment for them for the amount claimed and costs.

Tilling-Stevens Motors, Ltd., v. Kent County Council.

In the Chancery Division on May 2nd, before Mr. Justice Clauson, Tilling-Stevens Motors, Ltd., Maidstone, brought an action against the Kent County Council, claiming a declaration that two of their petrol-electric commercial vehicles were electrically propelled within the meaning of Clause 5 of the first schedule of the Finance Act, 1926, and were chargeable with licence duty as such.

Sir Arthur Colefax, K.C., for the plaintiffs, said the question was whether these were electrically-propelled vehicles and should pay a lower tax.

On the first vehicle the plaintiffs paid a higher tax than they should have done, and they claimed repayment of the difference, which application was refused by the defendants; and as regarded the second vehicle the defendants refused to grant a licence as an electrically-propelled vehicle.

Technical evidence was given for the plaintiffs.

The Attorney-General, on behalf of the defendants, said the only point in the case was whether the term "electrically propelled" meant a vehicle which included an electrical apparatus without which the power released could not reach the back axle, or whether, as he contended it meant, a vehicle in which the primary source of power was an electrical apparatus.

One possibility was a mechanical source of power and electrical transmission, and another was mechanical power and mechanical transmission.

His Lordship held that the vehicles were electrically propelled within the meaning of the schedule of the Act, and he granted the plaintiffs the declaration they sought, with costs.

Société Française Radio-Electrique v. West Central Wireless Supplies.

Before Mr. Justice Romer, in the Chancery Division on May 4th, an action was brought by the Société Française Radio-Electrique, of Paris, against the West Central Wireless Supplies, Gray's Inn Road, W.C., for an injunction restraining infringement of the plaintiffs' trade mark "Sferavox" for loud-speakers.

The plaintiffs' case was that, seeing a loud-speaker similar to theirs for sale in the defendants' window under the name "Sverovox," one of their employés bought it and got a receipt for a "Sferavox." The loud-speaker was found to be an infringement of the plaintiffs' trade mark.

The defence was that this was an isolated and innocent sale of an instrument which was sold to them as a "Sferavox." The defendants said they did not know the plaintiffs, or their trade mark, and they had no intention of selling any more loud-speakers which infringed the plaintiffs' rights.

His Lordship said the defendants acted throughout in perfect good faith, and he asked the plaintiffs' counsel if he would accept an undertaking from the defendants. This was agreed to. His Lordship thereupon said he would make no order, except that the defendants pay the costs, explaining that he gave judgment in this form because of the practice that had grown up of advertising injunctions or undertakings in the trade papers by trade-mark owners, which in cases of innocent infringement, such as this was, might cause considerable hardship to the defendants.

Alleged Frauds on Inland Revenue.

The Times reports that at Nottingham, on May 4th, Harold T. Hamill (*alias* Ernest Ashley Waddell), a retired tax inspector, was charged with obtaining money by false pretences; stealing certain income tax certificates; having in his possession dies made to resemble those used by certain companies, including the British Thomson-Houston Co., Ltd., and the Lanarkshire Tramways Co.; and having in his possession books containing documents intended to resemble and pass as certificates issued by those companies. Other charges concerned the uttering of alleged fraudulent income tax certificates and obtaining repayment orders from the Commissioners of Inland Revenue.

It was stated by the prosecution that, so far as was known, the defendant had succeeded in putting forward 25 fraudulent repayment claims, thereby obtaining £6,030 from the Commissioners in the past three years.

The hearing was adjourned.

Phototelegraphy in Austria.

Negotiations are proceeding between Ravag, the Austrian broadcasting authority, and the Fultograph Company for the regular transmission of pictures during the radio year beginning in the autumn. Ravag is satisfied of the capacity of the Fultograph, says *World-Radio*, but wishes to retain the utmost freedom as regards tests with other systems, at its own discretion.

Parliamentary News.

[By Our Special Parliamentary Reporter.]

Cleveland and Durham County Electric Power Bill.

A Bill promoted by the Cleveland and Durham County Electric Power Company, to extend its area of supply and to amend some of the provisions relating to the existing area of supply, was considered by a Committee of the House of Lords (presided over by the Marquis of Bristol) on May 1st. There was opposition by the Corporations of York, Harrogate, Ripon, Scarborough, Darlington and Stockton-on-Tees, and by the West Riding County Council.

Mr. Craig Henderson, K.C. (for the company) said that his clients had three "super stations," and a further station which was used for stand-by purposes. It had an authorised capital of £1,000,000, and had issued shares and debenture stock to the value of £697,000. Its capital expenditure exceeded £1.000,000, the balance being made up by loans from the Newcastle-on-Tyne Electric Supply Co., Ltd. The company had power to make agreements with the Newcastle Co. and the County of Durham Electric Power Supply Co., for mutual assistance, and the three companies had been associated in the supply of their areas. The company's sales had increased from 108 million kWh in 1917 to 227 million kWh in 1927. In 1916 the load connected to the mains of the associated companies was 81,469 h.p., and at the end of 1927 it was 194,000 h.p.—an increase of 130 per cent. It was proposed that the company's area should be extended as far south as Filey, on the east coast of Yorkshire, and that it should include the areas of supply of the York, Harrogate, Scarborough, and other undertakings. The object was to develop further the scheme which had been successfully carried on by the associated companies. The new area was mainly agricultural, and presented a problem which could best be tackled by such an organisation as this, which had the experience and the ability to give a proper supply. It was proposed that the company should be given power to supply in bulk to authorised undertakers in the new area, and to supply energy for power purposes to persons other than authorised distributors. The supply of energy for power purposes to consumers in the area of an authorised distributor would be subject to the consent of the authorised distributor concerned, from whose decision there was no appeal except in one or two cases. The company also sought power to supply railway, tramway, dock, harbour, canal and water authorities, for traction, pumping, &c., if any parts of the undertakings of those authorities were within the company's area of supply, even though those undertakings might be within the areas of authorised distributors. Power was also sought to supply electricity for lighting and general domestic purposes in any part of the new area which was not within the area of any authorised distributors. Provision was made that if any body later became the authorised distributors over any area within the new limits of supply, the company would not be able to supply consumers in that area for lighting or general domestic purposes except with the consent of the authorised distributors. The company would, however, be entitled to continue to give that supply unless and until the new distributors took over the mains which the company had laid specially for the purpose.

Proposals were to be submitted by the company to the Electricity Commissioners for the development of the new area.

Since the promotion of the Bill there had been some activity on the part of authorised distributors within the new area to obtain powers to extend their areas of supply, and he suggested that much of this activity was the immediate result of the launching of the Bill. An application by the Harrogate Corporation had become effective, and, in accordance with an undertaking given by the company, he asked that a clause be inserted in the Bill providing that any area which might be added to the area of supply of the Harrogate Corporation under the application made by it should be deemed to have been the Harrogate area of supply at the date of the passing of the Bill. An application had also been made by the authorised distributors at Whitby, and those distributors had accepted such a clause.

In effect the company would be a power company in the new area of supply; in the existing area the company was operating under the powers given to it in 1901, but it was considered that the time had come to make some alterations, and it was proposed to amend those powers in accordance with modern practice.

The Committee then adjourned and resumed the hearing on May 2nd, when Mr. R. P. Sloan, chairman of the Newcastle Company and the Cleveland and Durham Electric Power Co., was cross-examined by Mr. Tyldesley Jones, K.C., on behalf of the opponents. He admitted that his companies supplied at a frequency of 40 cycles, but all the supply in the new area would be given at the standard frequency.

The first part of the scheme would be to develop an area around the existing small station at Norton, now being run by an affiliated company of the North-East Coast power companies, the Northern Counties Co., and a supply would be given to 28 small townships and 80 miles of mains would be laid. No scheme had yet been prepared for the whole area because everything depended on the development of the "grid" system of the Central Electricity Board. The general development of the grid scheme in that area would take place much more quickly if the Bill were passed than if it were rejected. He put the additional cost of frequency changers at not more than 3 per cent.

Mr. TYLDESLEY JONES said that York, Harrogate and Ripon Corporations did not wish the company to have any rights in their districts, and therefore asked for their areas to be excluded from the Bill. If that were done the company could still give a supply in bulk if the corporations desired it. The Bill in its present form would give the power company the right to oppose these local authorities in the event of any application being made to the Electricity Commissioners for an extension of powers.

Mr. SLOAN said the whole area must be looked at comprehensively, and he could not contemplate cutting out any portion of it, otherwise he could go on doing that until there would be nothing left. The Bill had been framed from the point of view of the Electricity Act of 1926, and the policy laid down by the Electricity Commissioners, and he was not prepared to recede from that position. He was prepared to name a percentage which the power should bear to the total supply, when a supply was given to a power consumer and also for lighting in the same premises.

Speaking for the Stockton-on-Tees Corporation, which takes all its supply from the associated companies, Mr. JONES pointed out that under the Bill the Newcastle Company would be entitled to lay mains in the town, as well as the Durham Power Co., and he objected to another authority getting such a power. Mr. SLOAN said that all the three companies were under one management, and that in any case mains would only be laid by one authority.

Mr. H. A. COUVES, general manager of the associated companies, said that the Norton power station at present had a capacity of 450 h.p., and would shortly be extended to 600 h.p. d.c. The area around this part which it was proposed to develop immediately was 250 square miles, and the population 26,000. It was intended to submit proposals for this area, giving a supply of three-phase energy at 50 cycles immediately the Bill was passed, and the necessary plant would be installed in the existing generating station. The cable was estimated to cost £56,000, the sub-stations £8,400, low-pressure services and distribution £32,000, and the generating plant £12,000, a total of £108,000. The total revenue was put at £21,000 per annum. Only a very small part of that capital expenditure would be useless, he said, when the grid scheme came along. This closed the case for the promoters of the Bill.

On May 3rd Mr. C. W. SHIPLEY (chairman, York Electricity Committee) gave evidence against the Bill. He said that during the last seven years the electricity department of the York Corporation had been very progressive. The two power stations of the York Corporation generated 28,000,000 kWh during the year ended March 31st last.

Sir ERNEST PAINE (chairman, Harrogate Electricity Committee) also gave evidence against the Bill.

Mr. TYLDESLEY JONES then addressed the Committee on behalf of Stockton-on-Tees. The area, he said, was within the existing area of supply of the Cleveland Company, and the Corporation did not oppose the company's application for extension. The Corporation was at present taking a bulk supply from the company, and anything which extended the company's power to supply direct in the Stockton area would affect Stockton and lead to increased prices. He asked the Committee to delete from the Bill a clause giving the company power to lay h.p. mains through Stockton.

Mr. JAQUES ABADY (on behalf of Darlington) also urged that the powers of the company with regard to its existing area of supply should not be extended, and Mr. S. JONES (town clerk, Scarborough) gave evidence in opposition to the proposal to include Scarborough in the scheme.

Mr. THORPE (counsel for the Scarborough Corporation) said that if the Corporation made an application in the future to obtain a supply from anyone else, the company, if given the powers which it now sought, would be in a position to oppose the Corporation and to say that it (the company), having already statutory powers over that area, ought to give the supply, and the bias at any inquiry would be in its favour. He submitted that all the company was doing was asking for the privilege of exercising at some future date the right which it now sought. The Scarborough Corporation wanted to be completely unfettered.

Mr. W. J. JEEVES, K.C. (for the West Riding County Council), asked the Committee to say that no case had been made for the incursion of this north country company into the West Riding, with which it had no concern, and in which the County Council believed that it had already been able to secure the reasonable development of the means of a supply of electrical energy.

After Mr. CRAIG HENDERSON had addressed the Committee on behalf of the company, the Committee found in favour of the Bill. It added, however, that no authority was to be forced to take power from the Cleveland Company, confirmed an agreement that the roads of Stockton and Darlington should not be broken up, and deleted a clause by which the company sought power to invest money in other undertakings.

The Loop Direction-finding System.

On April 30th, Mr. DAY asked whether the preliminary trials of the rotating loop direction-finding system investigated by the Department of Scientific and Industrial Research had proved satisfactory; whether if it had been decided by the Board of Trade, in conjunction with the Air Ministry and Trinity House, to establish an experimental station of that type; and, if so, where that station would be established.

Mr. H. G. WILLIAMS said that as the result of the preliminary trials of the rotating loop system (a report on which, he understood, would be published shortly by the Department of Scientific and Industrial Research), it was proposed to erect an experimental station at Orfordness for air and marine navigation which could be tried under service conditions. The arrangements were not yet completed.

Claims for Compensation.

On May 1st, Mr. KELLY asked what was the number of claims made for compensation under the Electricity Act, 1919, for loss of employment by reason of the closing down of electricity stations.

Mr. BETTERTON said that referees had been appointed by the Minister of Labour under Section 16 of the Electricity Supply Act, 1919, to deal with claims for compensation covering 200 employés of 19 undertakings. The majority of the claims were on the ground of loss of employment through the closing down of generating stations. Other claims, of which he had no information, might have been settled by agreement between the parties.

High Lighting Charges.

On May 1st, Brigadier-General BROOKE asked the Minister of Transport whether he was aware that the present high charge of 7d. per kWh for lighting purposes was still in existence in Pontefract despite the low price of coal; and whether he would have inquiries made into the matter.

Colonel ASHLEY said he had received no representations with regard to the price of electricity in Pontefract since last year, and he was not aware of the present position. He would, however, cause further inquiry to be made.

Cable Conference Report.

On May 1st, Mr. BALDWIN, the Prime Minister, informed Mr. W. Baker that no report had yet been submitted by the Wireless and Cable Conference. It was not, therefore, possible for him to say anything with regard to its publication. No offer had been made direct to the Government with regard to the purchase of the whole means of Imperial telegraphic communication. He understood that certain suggestions in this connection had been laid before the Conference, and were still under consideration by that body.

Morse Interference with Broadcasting.

On May 2nd, Mr. W. BAKER asked the Postmaster-General whether he was aware that complaints of interference by morse from the new station at Portishead were being made in that area; whether his engineers had conducted experiments in the endeavour to eliminate the nuisance; whether he was aware that the adoption of the British Broadcasting Corporation's suggestion that a coupled circuit should be used had failed to give satisfactory results; and whether he would give the matter attention so that a remedy might be found.

Lord WOLMER, Assistant Postmaster-General, said that complaints of interference with broadcast reception by transmissions from the wireless station at Portishead had been investigated by Post Office engineers, and it had been found in many cases that the use of a loosely coupled receiving circuit had practically eliminated the trouble. The use of a frame aerial was also of material assistance in this respect. It was difficult to avoid some interference with broadcast reception in the vicinity of a wireless station; but the Post Office engineers would continue their investigations with a view to assisting listeners to adapt their apparatus so as to eliminate interference from the Portishead station.

An Electro-Mechanical Digger.

An electric power shovel, with a dipper that will gouge out 15 cubic yards, or nearly 24 tons of earth, in one bite, has been ordered by the United Electric Coal Company of Danville, U.S.A., from the Marion Steam Shovel Company; it will be electrically equipped by the General Electric Company of America, and is to be used in the open pit mining of coal in Illinois. The shovel boom will be 120 feet long and the dipper stick 82 feet long. Thus it will be able to lift material to a height of from 90 to 100 feet, and will be able to reach out over a radius of 150 feet from the centre of operations, covering a circle 100 yards in diameter. All the shovel operations will be controlled by one man, by means of three hand levers and one foot pedal. Power will come to the shovel through a trailing cable.

Phototelegraphy.

A Description of the "Telefunken-Karolus" System of Phototelegraphy, recently adopted by some British Newspapers.

IN the *Génie Civil* for March 31st, in the course of an article on phototelegraphy and television in general, an account was given of the Telefunken-Karolus system of phototelegraphy, based on a description published by Messrs. Kette and Kiel in the German paper *Telegraphen und Fernsprech-Technik*.

It is stated that a special type of photoelectric cell is used, which permits opaque images to be transmitted by reflection, without requiring them to be first converted into transparent images. Wireless transmission can be used. At the sending station is a cylinder, on which is stretched the image to be transmitted, and at the receiving station there is a cylinder on which is fastened sensitised paper. The image at the former station is explored photoelectrically by means of a photoelectric cell, which has to be given a special shape in order to deal with the diffused light reflected by the various elements of the opaque image. The inventor has adopted an annular form, as shown in section in fig. 1.

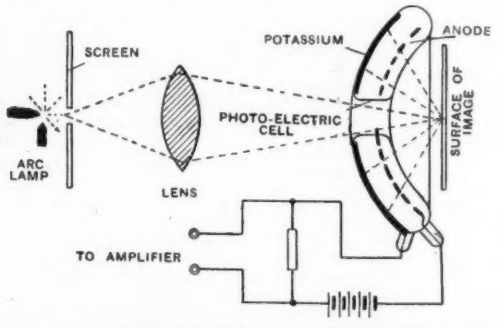


Fig. 1.—Arrangement of Annular Photoelectric Cell.

The photoelectric cell is arranged in such a manner that the beam emitted by a luminous source traverses the opening seen at the middle of the cell, and strikes the image in the form of a luminous speck about one-twenty-fifth of a square millimetre in area. The photoelectric cell is closely apposed to the cylinder carrying the image, and consequently the whole of the light reflected by the illuminated speck falls upon the cell, together with the weaker light reflected by the darker parts of the image. In order to generate currents of sufficient strength, the cell is filled with helium gas. In spite of the relatively high pressure of the gas, the natural frequency of the cell is much higher than 100,000 cycles per second. The image to be transmitted is "explored" along a spiral line with a pitch of 0.2 mm.; one square decimetre of the image includes 250,000 points.

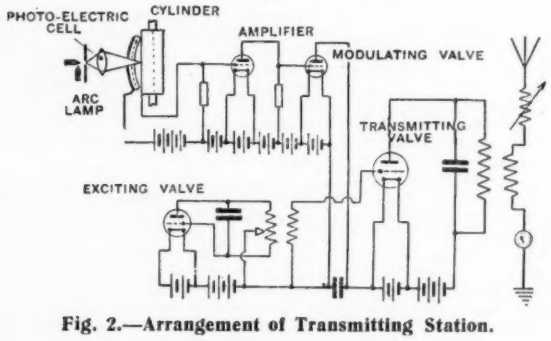


Fig. 2.—Arrangement of Transmitting Station.

The currents generated by the cell, corresponding to the intensity of the light which it receives, are amplified several times without distortion and are caused to modulate the current of a radio transmitter, fig. 2. Any system of wireless transmission suitable for radio-telephony can be used; the Telefunken Company employs modulation of the grid current. This current and that derived from a valve separately controlled are regulated by means of a modulating valve connected in parallel with a blocking condenser; the modulating valve is controlled by the amplified current of the photoelectric cell.

At the receiving station, fig. 3, the modulated high-frequency waves are rectified. The resulting low-frequency current, of which the intensity varies in accordance with the degree of transparency of the corresponding elements of the image, is amplified with a resistance-coupled amplifier and applied to the Karolus cell. The use of this amplifier is necessary to ensure the transmission without distortion of the wide bands of frequency which are met with when the speed of transmission is very high.

The Karolus cell, which is in effect an optical relay, is that element of the installation to which is due in the first place the increase of speed of transmission which it is possible to realise. The operation of this cell is based on the use of the "Kerr effect"—*i.e.*, the double refraction of polarised light. It comprises a kind of condenser of which the electrodes are separated by a transparent dielectric which produces double refraction—nitro-benzol or carbon disulphide, for instance. The electrodes are only a few tenths of a millimetre apart, and are about 5 mm. long.

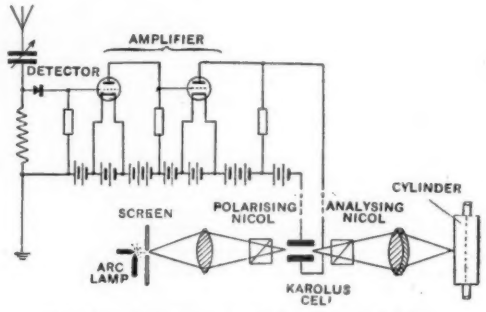


Fig. 3.—Arrangement of Receiving Station.

The cell is placed between two crossed Nicol prisms; a ray of light, which is polarised by the first Nicol at an angle of 45 deg. with regard to the direction of the field in the cell, is divided into two rays, of which the speed of propagation is different, under the influence of the dielectric. If, at the outlet of the condenser, the two components of the ray incident upon the second Nicol are made to interfere, the luminous intensity of the resultant ray will depend on the difference of phase between the components, this difference depending on the electric pressure applied; if an initial pressure of some hundreds of volts is applied, the dielectric becomes a perfect insulator. To operate a Karolus cell, a comparatively low voltage is sufficient. The luminous intensities obtained are great enough to affect the sensitised photographic paper or film roiled on the receiving cylinder, even when the speed of transmission is considerable.

The Telefunken-Karolus system has been in operation between Berlin and Vienna for some months, and was adopted in this country in March, the apparatus being supplied by the Siemens-Schuckert Company.

Electrical Cooking Appliances.

A Lecture before the London and Home Counties Ironmongers' Association.

A WELL-ATTENDED meeting of the London and Home Counties Ironmongers' Association was held on April 19th, when an address was given by Mr. D. G. W. Acworth, of the General Electric Co., Ltd. The author chose as his subject "Electrical Cooking Appliances," and in reviewing the outstanding features of the electric cooker said that the chief development noticeable in recent years was in connection with the hotplates. The manufacturer had endeavoured to meet the demand for a plate sufficiently robust to give long life with reduced maintenance charges for the engineer, and yet sufficiently quick in operation to meet the public requirements for an electric appliance comparable with the gas ring. The reason underlying the difficulty of meeting the latter demand was that, whereas in the gas ring the gas could be consumed at a rate only limited by the number of jets and pressure of the gas, in the electric hotplate both the length of the resistance wire and the working temperature of the wire put a limit to the total loading of a plate of any given size. The result was that in the electric hotplate the heat output could never exceed about 55 to 60 per cent. of the equivalent heat output of the gas ring of the same diameter. Manufacturers were, however, concentrating on the production of totally-enclosed or solid-type hotplates immune from the troubles experienced with the exposed open-coil type, and yet of a thermal capacity small enough to permit of rapid boiling.

In the case of the oven, the old controversy between top and bottom and side heating continued, with no tangible result. They could not overlook the growing tendency towards small portable grillers, table ovens, and so-called breakfast cookers. From a sales point of view these should appeal strongly to

ironmongers and stores as a means of introducing electric cooking to many of their customers who were not in a position to have an electric cooker. It was through the medium of these smaller appliances that the public could eventually be educated up to the idea of electric cooking and be encouraged to purchase their own stoves. Although the hiring of electric cookers by supply undertakings was forging rapidly ahead, electric cooking was still in its infancy in this country, and while the public could not be blamed for preferring to hire cookers and get free maintenance, especially where such troubles were likely to be encountered as those connected with open-coil hotplates, &c., the introduction of totally-enclosed plates and the general improvement in cookers all round, making them more simple and more fool-proof, would have the effect of encouraging more people to buy their cookers outright.

Other obvious factors in the development of electric cooker business were the reduction of electricity charges and the development of hire-purchase systems.

While we were ahead of the Americans in some of our industrial applications, such as bread making, and so on, we were still a long way behind on the domestic side; but the interest now shown by training centres for domestic subjects and schools with cookery classes would eventually have its reward when the present conservative ideas of cooking were superseded by the housewife, who would not be content with anything but an all-electric home.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

A Plea for Courtesy.

With reference to "Hopeful's" letter in this week's issue, since I completed my articles five years ago, I have been in the habit of applying for some of those good jobs which keep appearing in the REVIEW.

I have only received word to the effect that the positions have been filled three times; and I have only seen it advertised, in the column which you so kindly provide for that purpose, twice. In consequence I have ceased to waste any more good notepaper on such things.

It seems to me that the young engineer of to-day, no matter what his qualifications, must either work for a mere pittance, or go on the "dole."

Then again, there is the man who offers himself in the "Situations Wanted" column, in this manner: "Salary of secondary consideration," &c. What those people are thinking about I do not know, but whilst they are about, the man who rightly thinks that he deserves to be paid properly for the use of his brains, does not stand much chance.

I should like to hear some other young engineers' views on this matter.

Another Hopeful.

May 6th, 1928.

The letter of "Hopeful" in your issue of May 4th comes as a surprise to me, as during the last three months I have applied for approximately 20 situations offered by Councils, Corporations, box numbers, &c.; and although I have not sent a stamped addressed envelope in any case for a reply, the only firms who have not replied or sent to say that the situation is filled have been box numbers.

I should like to take this opportunity to thank all the firms, councils, &c., *except box numbers*, to whom I have applied, for the courteous way in which they have treated my applications.

H. Power.

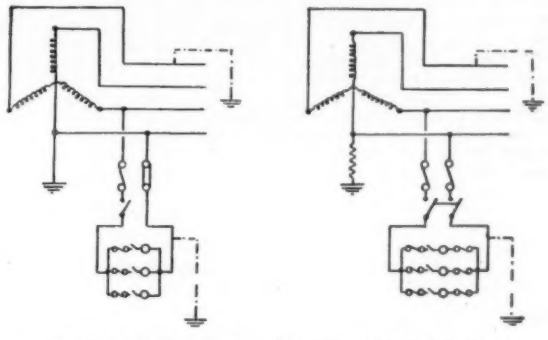
London, *May 4th*, 1928.

Single-pole Fuseboards.

It is impossible to answer the queries of your correspondent "Electron" unless one knows a few more details of the manner in which the neutral point of the transformer is "earthed at the sub-station." This is the crux of the whole question.

(*a*) If the neutral point is permanently dead-earthed, then, neglecting the small voltage drop due to out-of-balance currents, the conductor connected to it in the distributing cable is always at earth potential, unless, of course, it is severed due to a burn-out caused by a fault in the cable itself. (*b*) On the other hand, if the neutral point is earthed through a resistance (which is inserted in order to limit any earth fault current to a predetermined figure), in the event of any phase conductor going to earth, the neutral wire attains a pressure to earth equal to the voltage drop across this resistance, which in the limiting case becomes equal to the full phase-to-neutral pressure. Thus, in the case of (*a*) the operation of a single-pole switch placed only in the phase conductor at the point of entry of the supply cable to a house will render its installation dead, but in that of (*b*) it is necessary to break both phase and neutral by means of a double-pole switch, in order to ensure that all pressure has been removed. If one is doubtful of the actual connection of the neutral point to earth, it is much better to install a double-pole switch in any case, and usually most supply authorities insist on it.

With regard to fuses at the point of entry of the service cable, a fuse, of course, must always be inserted in the phase conductor. As regards the neutral, however, considering case (*a*) first, suppose an earth occurs on the neutral wire of an installation, as shown in the diagram. Then, if an earth should



(*a*) Neutral point permanently earthed. (*b*) Neutral point earthed through resistance.

Diagram.

develop on a phase conductor at any point of the system supplied by the transformer, part of the fault current will flow through the fault in the consumer's installation back to the neutral point and part directly through the ground. The greater part will take the latter course, on account of the comparatively low resistance of the main earth connection at the neutral point; while the remainder passing through the consumer's neutral wire will be relatively small. Therefore, in such a case the fuse in the neutral conductor is sometimes omitted and merely a link is fixed. In the case of (*b*), however, under like conditions practically the whole of the fault current will pass through the consumer's neutral conductor, by reason of its being the easier path compared with the limiting resistance. In the case of house wiring, of the order of 3/.029 or 3/.036, this may be highly dangerous, and therefore it is essential to have a fuse in the neutral conductor as well as in the phase conductor.

In like manner, as regards distribution boards, in the case of (*a*), single-pole fuses on the phase conductors only will meet the case, but in that of (*b*) double-pole fuses are necessary.

In actual practice, however, there are very few public supplies where one can absolutely rely upon the neutral point being *always* connected directly to earth, as at (*a*), and, in my opinion, as an engineer engaged in the electricity supply industry, I strongly advise the provision of double-pole main switch and fuse control of all services, and double-pole distribution fuseboards in all installations.

Reg. H. Rawll, A.M.I.E.E., A.M.I.Mech.E.

Birmingham, *May 4th*, 1928.

The Smelting of Tin Ore.

In paragraph 3 of our letter (published May 4th) *quality* should have read *quantity*—the former word was a clerical error. We should feel obliged if you would call attention to the correction.

For **R. M. Catterson-Smith,**
J. PLUMMER.

London, *May 5th*, 1928.

"Applications are invited . . ."—A Reply.

A man, not in the electrical industry, looked at several copies of your journal. His comment was: "The REVIEW realises that there is something more in life than obtaining boosting articles that meet with the full approval of its advertisers." So may I make use of the safety valve you provide in your correspondence columns?

Is there such a person as Mr. Hunter Faichney? Did he ever engage a staff? Or is his article a rehash of the articles which appeared two years ago? Men are not machines, or, alternatively, why are employers so inconsistent—would they buy a machine from the description given by a sales manager? Why not add this paragraph to the advertisements: "The chief engineer will see applicants between 2 and 4 p.m. on May 28th-31st"?

Two years ago, when I started trying for promotion, I collected all the information and tips I could, and spent 2s. per application for typing, &c. I enclosed short technical statements, and where such points should be appreciated I used enterprise to get my application delivered before even the REVIEW, without results; so now I send almost the same reply to all and trust that some day someone will give me a lift.

What are "recent testimonials"? Is one dated 1919 any good when it covers your apprenticeship days, or should you get the people who employed you up to 1919 to give you a fresh one dated 1928?

A senior and his assistant applied for the same post: of course the younger man got the promotion. It is always so. Now who is the most use—a man who gets his degree at 23 with certain financial advantages, or a man who, by grit and determination, passes at 30 with the aid of evening work?

"*In one notorious case . . . the applicant had repeatedly obtained posts he . . . wrongly claimed credit for.*" "*If you are honest you will not overstate.*" Which is wiser? Remember it was not the employer who started the inquiries, but the employés' protection society. Recently certain people gave nearly 10 hours' stiff examination to the final candidates for an important post. This is the fairest method for responsible posts. Even the unsuccessful men must have been better able to apply for the next post. I have been told I knew too much for certain work, and that in three years I should want promotion. Does any employer deceive himself that members of his staff remain after they can get promotion?

But in spite of these remarks I enjoy life with a keen mind and am able to run a mile without getting winded although I am

Aged 36.

England, *May 7th*, 1928.

Lead-sheathed Cable Attacked by Rats.

We are enclosing herewith a piece of lead-covered twin cable, supplied to us 16 years ago by Messrs. Johnson & Phillips, Ltd., and installed in a local granary. This has apparently been attacked by rats for some years, as you will notice by the sample enclosed, but a fault did not occur until quite recently.

To us this is a novelty, and we shall be interested to hear if any other electrical contractors have experienced anything of the same character.

M. W. Groom & Sons,
J. Y. ELLIOTT.

Towcester, *May 7th*, 1928.

[The lead sheath has been gnawed away over a length of 3½ inches, and the strands of one of the conductors are exposed and slightly corroded.—EDS. ELEC. REV.]

Battery Eliminators.

It is somewhat unusual to find a representative of a manufacturing firm acting as an advocate of safety precautions; Mr. Scroggie, and the firm with which he is associated, are to be complimented on their attitude.

The principal points regarding the installation of eliminators and battery chargers may be summarised as follows:—

(1) It does not appear to be generally appreciated that the provision of an earth connection in a room alters the safety requirements so far as electrical apparatus is concerned.

(2) It is exceptional to find that a "wireless earth" connection complies with the appropriate Institution of Electrical Engineers regulations.

(3) Ordinary wireless components are not designed, and are not suitable, for operating at distribution pressures.

(4) Any metal work likely to become alive, and all metal in electrical connection with the supply mains, comes within the scope of the installation regulations.

(5) This means that safety precautions are required in respect of the receiving set and telephones where d.c. eliminators are contemplated.

(6) An ordinary telephone transformer is insufficient to insulate adequately the telephone from the receiving set—ample insulation suitable for connection to a power circuit, an earthed case and secondary winding, and preferably an earthed screen between primary and secondary windings, are necessary.

(7) On a 250-500 volt, three-wire, direct-current supply, either outer may operate at 500 volts to earth during network fault conditions.

(8) It follows, therefore, that the application of d.c. eliminators to existing sets is unsatisfactory, and that the only way to overcome the objections is to build the set and mains equipment as a complete enclosed unit, observing the necessary precautions.

(9) It is standard practice to fix lighting arrestors at points where aerial lines (power or telephone) enter buildings or are connected to underground mains, but, so far as I know, this is never done with domestic wireless aerials. There is a possibility of damage to the set, and interference with the public supply, where eliminators are used without such precautions.

(10) Eliminators, mains-operated sets, and battery chargers, should be controlled from a plug with efficient earth connection.

(11) The use of celluloid-cased accumulators is to be deprecated.

(12) The use of d.c. eliminators is drastically restricted by the V.D.E. rules.

J. L. Carr, B.Sc., A.M.I.E.E.

Manchester, *May 7th*, 1928.

Applications for Special Orders.

The Electricity Commissioners have issued new rules with respect to applications for Special Orders, &c., under the Electricity (Supply) Acts, which were to come into force immediately, taking the place of the Rules issued in 1920 and those relating to statutory gas companies which were issued in 1927. The new Rules are published by H.M. Stationery Office, price 4d. net.

Reviews.

Practical Television. By E. T. LARNER. Pp. 175; figs. 97. London: Ernest Benn, Ltd. Price 10s. 6d. net.

In a foreword to Mr. Larner's book on "Practical Television," Mr. J. L. Baird observes that wireless broadcasting has somewhat regrettably given a preponderating interest to the study of phenomena connected with high-frequency electrical oscillations. Other branches of science unconnected with wireless have been almost completely ignored. Television, he continues, unlike wireless, covers optics, chemistry, mechanics, in fact, every branch of science, and introduces its devotee to a knowledge of the physiology and psychology of vision. Mr. Larner's book certainly gives the reader a liberal idea of the versatile character of the problem of television, and in the chapter dealing with the historical side of the subject he describes the many types of apparatus which have been invented for telegraphing "still" pictures and have therefore led up to the telegraphy of motion pictures—the actual art of "television."

A chapter on selenium cells is excellently written, and its brief character is welcome owing to the fact that, attractive as selenium is as a light-sensitive element, it must be relegated to the things of history in view of the emphatic advantages offered by the photo-electric cell. The subjects of photo-electricity and the construction of photo-electric cells are discussed at some length, though it is rather surprising that no description is given of the special cells that have been worked out in the Bell Telephone Laboratories under Dr. Ive's direction for the television apparatus of that organisation. While, too, descriptions and diagrams are given of such comparatively untried systems as those of Belin and Holweck, Mihaly, Dauvillier, and so on, the briefest description is given of the one American system of outstanding merit, that of the American Telephone & Telegraph Company, which has recently proved the practicality of television beyond all doubt, and has satisfied the most critical scientific investigation.

The television system of Dr. Alexanderson, of the General Electric Company, Schenectady, is described at some length, and the author remarks that when describing it early last year before the American Institute of Electrical Engineers, the inventor did not give any demonstration. This is true of many so-called systems which exist largely on paper, but it should be noted that some highly interesting demonstrations of Dr. Alexanderson's apparatus have just recently been given, a reference to them having been made in this journal.

Mr. Baird's work, needless to say, comes in—deservedly—for its full share of treatment, and we are glad to find that anything in the way of exaggerated claims for that or any other system has been studiously avoided. Mr. Larner's book is, in fact, a scientific treatment of the whole subject, written in an admirably clear and simple manner, giving the lay reader a bird's-eye view of the technical problems involved, and the electrically-minded reader a basis on which to engage in experimental work.

T.T.B.

Electro-farming: or the Application of Electricity to Agriculture. By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S. Pp. xvi+357; 146 figs. London: Ernest Benn, Ltd. Price 25s. net.

The literature of electricity in its application to agriculture is not yet extensive, and until this book appeared there was in fact no authoritative treatise on the subject in the English language, in spite of the importance which this branch of electrical engineering has already attained. Hence Mr. Matthews's work is heartily welcome, and all the more so because he is not only an electrical engineer of mature experience, but also a practical farmer on a large scale, and has for many years put into practice under his own supervision the principles which he now sets forth for the guidance of others. On his 600-acre farm, he tells us in his preface, "there are now about 67 different applications of electricity—and only two horses are employed"; moreover, the farm has been conducted on strictly commercial lines, the author having devised an exceptionally efficient system of account-keeping for the purpose. His frequent visits to the Continent have kept him familiar with the latest developments in many European countries, and the work before us contains not only a chapter devoted to foreign progress, but also numerous references to and illustrations from practice overseas.

The work is divided into nineteen chapters, the first seven of which deal with various aspects of the supply and application of electricity to farms, whilst each of the remainder is devoted to a particular operation or department of agriculture. At the end of every chapter is an ample bibliography, the references being mainly to papers and articles to be found in the proceedings of societies and the technical and trade Press. The author having found in the course of his investigations that the degree of electrification of agriculture in a district depends largely upon the activity of the engineer in charge of the local electricity supply undertaking, one chapter is addressed to him, showing that the farm load is well worth his attention and, as the tabulated data indicate, is potentially

as important and profitable as the ordinary urban load; but the next chapter explains how the farmer who cannot obtain a supply of electricity from the mains can provide for his own requirements by means of water, wind, or oil-engine power. The various modes of driving agricultural machines and appliances with electricity are described, with numerous illustrations and tables of mechanical and electrical data, and the transmission and distribution of electricity by overhead lines is fully dealt with (incidentally, the author is president of the Overhead Lines Association). After an interesting chapter on rural industries, of which a lengthy list is given, the author turns to the detailed treatment of the installation and uses of electricity on the farm, from the major operation of ploughing (which may employ motors of 150 h.p.), to which the longest chapter in the book is allocated, to the effect of electric light and heat on bees—the shortest chapter.

The temptation to quote extensively from this absorbing volume is difficult to resist; it abounds with interesting and valuable items of information, covering not only fully developed practice, but also the investigations which have been and are being carried on by official and private research in various directions. The present importance of electricity in agriculture is demonstrated by the development already realised especially on the Continent; its immense possibilities, foreshadowed by Col. R. E. Crompton in a brief introduction, are emphasised by the perusal of this book, obviously the work of an enthusiast—but an enthusiast who gives chapter and verse for the faith that is in him. No one who is in any way concerned with the uses of electricity in agriculture can afford to do without this work, which does credit to both author and publisher, and will certainly rank as "classic" in its subject.

Incidentally, the decimal system of classification is adopted throughout the work.

Piles et Accumulateurs Electriques. By LUCIEN JUMAU. Pp. 194; 76 figs. Paris: Librairie Armand Colin. Price 10 fr. 25.

The author of this little book is a well-known authority on his subject; he has here endeavoured to set forth the theory and practice of primary and secondary cells in a manner suitable not only to the amateur, but also to the serious student, and to the technician with little time to spare who, nevertheless, wishes to improve his acquaintance with the subject. Beginning with the elementary theory of the voltaic cell, which is by no means superficially treated, he proceeds to describe the construction and behaviour of the many types of primary cells, including recent forms such as the AD and the Féry, in 50 pages. The rest of the book is devoted similarly to the accumulator, several chapters being allocated to the treatment of the theory and characteristics of accumulators in general, with numerous diagrams and tables of data; and in the concluding chapter, of 59 pages, the various applications of accumulators and the special types employed for different purposes are described. It is somewhat regrettable that, especially in the last chapter, the author confines his illustrative references mainly to one particular make of cell, the name of which appears under most of the figures; nevertheless, the book contains a mass of useful technical information and can be recommended with confidence.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1926.

17,287. "Electrical heaters." Curtis Manufacturing Co., Ltd., and F. C. Curtis. April 4th, 1927. (288,452.)

24,720. "Electrical indicating instruments." W. G. Nagel Electric Co. October 7th, 1925. (259,576.)

30,349. "Thermionic valves." J. Robinson. November 30th, 1926. (288,663.)

1927.

360. "Means for supporting and connecting apparatus used in telephone or like systems." Standard Telephones & Cables, Ltd., B. B. Grace and S. T. Buer. January 5th, 1927. (288,682.)

437. "Method of electric testing and measuring and circuit arrangements therefor." Siemens Bros. & Co., Ltd., and W. H. Grinstead. January 6th, 1927. (288,685.)

548. "Electrical prepayment meters." A. E. G. Machinery & Apparatus Co., Ltd., and B. M. Smith. January 7th, 1927. (288,688.)

720. "Light signals." British Power Railway Signal Co., Ltd., S. L. Glenn and E. E. Pierce. January 10th, 1927. (288,694.)

861. "Sound-reproducing apparatus." British Thomson-Houston Co., Ltd., and J. Hutt. January 11th, 1927. (288,711.)

902. "Loud-speakers." N. W. McLachlan. January 11th, 1927. (288,713.)

910. "Telegraphy and telephony." H. V. Flinn and J. Henley. January 12th, 1927. (288,714.)

1,061. "Magneto-electric generators." G. E. Bairsto and F. G. Haydon. January 13th, 1927. (288,720.)

1,083. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and L. M. Simpson. January 13th, 1927. (288,723.)

1,248. "Regulating apparatus for electric circuits." British Thomson-Houston Co., Ltd. January 15th, 1926. (264,527.)

1,279. "Electrical couplings." E. V. Robinson, E. J. E. Hubbard, F. E. Bancroft and Metropolitan-Vickers Electrical Co., Ltd. January 15th, 1927. (288,731.)

1,379. "Measurement of thermal conditions in oil immersed electrical apparatus." E. D. T. Norris and Ferranti, Ltd. January 17th, 1927. (288,735.)

1,390. "Wireless telegraphy and telephony." G. M. Wright. January 17th, 1927. (288,736.)

1,391. "Vapour-electric apparatus." A. V. Tomlinson (Cooper-Hewitt Electric Co.). January 17th, 1927. (288,737.)

1,916. "Electric contact devices chiefly designed for use with burglar-alarm systems." F. O. Korry and Rely-a-Bell Burglar & Fire Alarm Co., Ltd. January 22nd, 1927. (288,743.)

2,079. "Use of gasfilled photo-electric cells." General Electric Co., Ltd., and N. R. Campbell. January 24th, 1927. (288,747.)

2,437. "Type-printing and the like telegraph apparatus." Central News, Ltd., and F. W. Jarvis. January 27th, 1927. (288,753.)

2,640. "Telephone apparatus for use in connection with ladders." Carter and Co. (Nelson), Ltd., and F. Carter. January 29th, 1927. (288,756.)

4,416. "Electric lampholder and the like." R. Nettle. February 17th, 1927. (288,774.)

4,585. "Protection of electrical apparatus." General Electric Co., Ltd., and W. Wilson. February 18th, 1927. (288,776.)

5,247. "Circuit-breakers for use in alternating-current electric circuits." R. H. Barbour. February 24th, 1927. (288,781.)

5,364. "Gasfilled photo-electric cells." General Electric Co., Ltd., and N. R. Campbell. February 25th, 1927. (288,783.)

7,722. "Electric heating apparatus." Young, Osmond & Young, Ltd., and D. G. Petrie. March 21st, 1927. (288,799.)

8,948. "Electrically heated flat-iron with various adjustable temperatures, which then automatically remain constant." J. Jerike. March 31st, 1927. (Convention date not granted.) (268,810.)

9,498. "Sound-reproducing instruments, such, for example, as loud-speakers." R. Custerson. April 6th, 1927. (288,810.)

9,812. "Electric couplings." F. L. Goddger. April 9th, 1927. (288,813.)

11,331. "Electric incandescent lamps." General Electric Co., Ltd. (R. Briske). April 28th, 1927. (288,827.)

12,950. "Means for operating mercury switches." Soc. Anon. Hewittic and M. Demontvignier. June 22nd, 1926. (273,257.)

13,156. "Electrically driven windscreen cleaner." A. Malkovsky. November 22nd, 1926. (280,852.)

13,829. "Electrolytically recovering pure tin from impure stanniferous materials." Berzelius Metallhutten Ges. May 21st, 1926. (271,521.)

14,379. "Electric hand lamps." J. F. W. Johnson. May 28th, 1927. (288,846.)

16,489. "Advertising and like signs." A. H. Brackensey and Franco-British Electrical Co., Ltd. June 21st, 1927. (288,856.)

16,636. "Suspension clamps for electric conductors." J. W. Hofmann. June 23rd, 1927. (288,857.)

17,310. "Electrically heated soldering irons." J. Bagwell-Purefoy and G. W. Raby. June 29th, 1927. (288,859.)

18,742. "Electric fuses for projectiles." Rheinische Metallwaaren-und Maschinenfabrik. September 1st, 1926. (276,965.)

18,821. "Transformers." International General Electric Co., Inc. July 16th, 1926. (274,414.)

19,146. "Electric circuit interrupters." British Thomson Houston Co., Ltd. July 29th, 1926. (275,216.)

20,144. "Electric switches for use on motor road vehicles and for other purposes." E. S. Brooks. July 20th, 1927. (288,873.)

20,770. "Holding devices for the supply cable of electric railways." F. Berg. August 6th, 1927. (288,877.)

21,368. "Protective systems for electrical circuits." Metropolitan-Vickers Electrical Co., Ltd. August 23rd, 1926. (276,330.)

21,402. "Apparatus for providing a visible image of an object which is in darkness." Television, Ltd., and J. L. Baird. October 15th, 1926. (Cognate applications 2,328/27 and 6,730/27.) (Divided application on 25,773/26.) (288,882.)

21,655. "Three-way or four-way junction box or connector for electric conductors." J. R. English. August 17th, 1927. (288,885.)

23,447. "Wireless receiving systems." Telefunken Ges. fur Drahtlose Telegraphie. September 6th, 1926. (277,039.)

24,175. "Vehicle headlamps." W. H. Lund and W. C. Howard. September 14th, 1927. (288,898.)

25,396. "Clamping-ear for supporting electric trolley wires." T. Yamanouchi. September 26th, 1927. (288,901.)

26,060. "Maximum recording electricity meter" Soc. Genevoise d'Instruments du Physique. December 17th, 1926 (282,349.)

26,105. "Snap-action mechanism for electric switches." P. Krageloh. October 3rd, 1927. (288,905.)

27,058. "Method of producing combined pictorial and sound records." British Thomson-Houston Co., Ltd. December 2nd, 1926. (281,615.)

27,206. "Electric trolleys for cleaning ducts or conduits." Siemens-Schuckertwerke Akt. Ges. October 16th, 1926. (279,007.)

27,215. "Electric torch-lamps." J. Neu and J. Neuburger (trading as Enn-Werke Neu and Neuburger). November 27th, 1926. (281,233.)

27,216. "Electric torch-lamps" J. Neu and J. Neuburger (trading as Enn-Werke Neu & Neuburger). February 22nd, 1927. (Addition to 281,233.) (285,827.)

27,298. "Sound recording." British Thomson-Houston Co., Ltd. October 30th, 1926. (279,826.)

28,149. "Means for suppressing the earth-connection current in high tension electric mains." Siemens-Schuckertwerke Akt Ges. October 28th, 1926. (279,841.)

32,444. "Directional aerial systems." L. Bouthillon and Société Générale de Télégraphie sans Fil. November 4th, 1926. (280,224.)

32,408. "Electric incandescent lamps." General Electric Co., Ltd. December 8th, 1926. (282,044.)

32,583. "Self starting asynchronous motors." International General Electric Co., Inc. December 2nd, 1926. (Addition to 237,911.) (281,706.)

32,674. "Cascade connection of asynchronous motors." International General Electric Co., Inc. December 4th, 1926. (281,712.)

1928.

1,133. "Telephonic apparatus for the aid of deaf persons." T. B. Smith. January 12th, 1928. (288,950.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from May 2nd:—

Synchratune. No. 488,878. Class 8. Apparatus for use in radio-telegraphy and telephony.—S. S. Bird, Cyldon Works, Sarnesfield Road, Enfield, Middlesex.

Statue Figure (design only). No. 481,616. All goods in Class 8, except thermionic valves.—Mullard Radio Valve Co., Ltd., 45, Nightingale Lane, Balham, S.W.12.

Sammode. No. 488,849. Class 13. Ordinary electric lamps. No. 488,848. Class 18. Lighting installations.—La Société des Applications des Methodes Moderres d'Eclairage Electrique Sammode, Paris. (British representatives: Mewburn, Ellis & Co., 70 72, Chancery Lane, W.C.2.)

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

BEDDINGTON AND WALLINGTON.—Houses (36), The Chase, for G. Ferguson. Church, London Road, for Rev. J. Bevan.

BEXHILL.—Houses, Hastings Road, Maple Walk, and South Cliff; J. E. Maynard, Collington Avenue.

BIRKENHEAD.—Elementary school, Trinity Street (£20,500); Education Committee. Dairy factory, Park Road South; Co-operative Wholesale Society, Ltd. Housing scheme (208), for the T.C.; R. W. Johnston, borough engineer (returnable deposit of £2 2s.).

BIRMINGHAM.—288 houses, Fox Hollies Estate; W. J. Simms, Sons & Cooke, Ltd. Extensions, King's Norton secondary school; J. Goodman.

BLACKPOOL.—Extension of Victoria Hospital; secretary.

BOLTON.—Fruit and fish markets, Bessemer site; borough engineer. Extensions, Kirkbrook Road; Joseph Johnson (Bolton), Ltd. Chemical and ash mixing rooms, Mortfield Bleachworks; Thos. Cross & Co., Ltd.

CAMBRIDGE.—County hall, for Cambs. C.C.; county architect.

CARLISLE.—Additional 100 houses, for the T.C.; city surveyor.

COURTNEY DE WYCK (SOMERSET).—Tannery, electrically equipped, for F. Millward & Co. (£20,000).

CROYDON.—Dance hall, Brighton Road; G. O. Scorer, 46, Lincoln's Inn Fields, W.C. 52 houses, Florida Road; R. Pierson, 47, Wakehurst Road, S.W. Workshops, 121-123, North End; T. H. Marton & Co. 13 shops and 21 garages, London Road; J. A. Dartnall, 11, Dowgate Street, E.C.

DONCASTER.—Infirmary (£78,000); Harold Arnold & Son, Ltd., builders.

DUNDEE.—Church for U.F. Presbytery; C. Scott, solicitor.

DURHAM COUNTY.—Dairy and cow byre at Houghall County Council Farm; Hays & Gray, architects, Wingate.

EDINBURGH.—Buildings (£50,000), for Edinburgh District Board of Control; S. Kaye, architect.

GRETNA.—Antimony sulphide factory, for the Caledonian Electro-Chemical Co., Ltd., Glasgow.

HARROGATE.—Infirmary buildings, Knaresborough Road (£37,250); Shepherd & Son, Ltd., builders, York.

HULL.—Motor house and pump chamber, East District pumping station; Quibell & Son, Ltd. Senior block, Francis Askew School (£30,500); R. G. Tarran. Reconstruction, Castle Howard School (£5,000); Management Committee. Temporary school, Flinton Grove (£8,000); Education Committee. Extensions, Canister Works, Southcoates Lane; F. Robinson & Co., Ltd.

ILKESTON.—74 houses, Central Estate; borough engineer.

IRISH FREE STATE (CORK).—152 houses, Turner's Cross housing site; Chillingworth & Levie, architects, 11, South Mall.

KENDAL.—Engine house, electricity works, for the T.C.; town clerk (returnable deposit of £1 1s.).

KIRKINTILLOCH.—School for Dumbartonshire Education Authority (£52,000); clerk, Education Authority, Dumbarton.

LAXEY.—Electric lighting installation, new school, for Isle of Man E.C.; T. R. Lewin, clerk, Strand Street, Douglas.

LEAMINGTON SPA.—Alterations, Welford Lodge, Lillington Road, for H. H. Hands.

LEEDS.—160 houses and 56 flats Henconner Estate, 50 houses Meanwood, 90 houses, York Road; city architect. Municipal laboratory; Baird & Tatlock (London), Ltd. Extensions, Oil Depôt, Clarence Road; Anglo-American Oil Co., Ltd.

LEITH.—Secondary school for Edinburgh Education Authority (£73,000), and swimming baths (£10,000); Reid and Forbes, architects, Ainslie Place, Edinburgh.

LONDON (ILFORD, E.).—Town hall extensions, with Council chamber, mayor's parlour, and municipal offices (£54,000), for the T.C.; borough engineer. Saw mills and timber yard, High Road; G. Cushing. 23 shops and houses, Beehive Parade; Moore & Dartnall. 10 shops and houses, Green Lane; E. Meredith.

(MARYLEBONE, N.W.).—63 flats, Salisbury Street; Marylebone Housing Association, Ltd.

(CAMDEN TOWN, N.W.1).—New Roman Catholic church; rector, Catholic Church.

LONDON—*continued.*

(DEPTFORD, S.E.).—Dwellings, 37 tenements, Hughes Fields Estate; A. E. Symes, Ltd., Stratford.

(LEWISHAM, S.E.).—Extensions, St. Saviour's Roman Catholic Church, High Street (£11,000); priest-in-charge.

(WESTMINSTER, S.W.).—Extensions, Corner House, Strand; J. Lyons & Co., Ltd.

(WIMBLEDON, S.W.).—Garage, showroom and offices, Hartfield Road; North, Robin & Wilsdon. Automobile depôt, Worple Road; J. Ross Willis. 26 houses, Woodside; Bleach & Dorey, Ltd.

MAIDENHEAD.—Additions, Laggan House, Moor Lane, for Lady Gardner.

MAIDSTONE.—Housing scheme (179), Hastings Road, for the T.C.; T. F. Bunting, borough surveyor.

MANCHESTER.—Alterations and additions to the Burnage Municipal School (deposit £2 2s.); director of education, Education Offices, Deansgate.

MANSFIELD.—Extensions, Boys' Grammar School (£6,000); governors.

MIRFIELD.—Premises for Mirfield Perseverance Co-operative Society; Hustler & Taylor, architects, Ropergate, Pontefract.

NEWCASTLE-ON-TYNE.—Housing scheme (375); housing architect, 18, Cloth Market.

NEWLAND (LINDSEY, LINCS.).—County Council offices (£11,300); Jno. Harvey, builder, Mansfield.

NOTTINGHAM.—Premises at Dorothy Vernon House, Friar Street, for Nottingham Permanent Building Society; Messrs. Starry Hall, architects, 12, Victoria Street.

OLDBURY.—Housing scheme (22), Birchfield Lane, for the U.D.C.; W. Greenwood, surveyor (returnable deposit of £2 2s.).

OLDHAM.—New wards, Union Street; Royal Infirmary governors. Extensions, X-ray department, Rochdale Road; Board of Guardians. Mission hall, York Street; Wagle Street Wesleyan trustees. Working Men's Home, Middleton Road; W. Mooney.

ORSETT (GRAYS).—Housing scheme (122), for the R.D.C.; surveyor, Palmer's Avenue, Grays.

PLYMOUTH.—267 houses, North Prospect; A. Snape.

PRESTON.—Extension of the Technical College (£42,000); director of education.

ROMSEY (HANTS).—Housing scheme (30), Dutton's Road, for the T.C.; A. H. Brain, architect, Town Hall (returnable deposit of £3 3s.).

ROTHERHAM.—400 houses, Herringthorpe Estate; borough engineer.

RUGBY.—Engineering wing, Technical School (£8,000), for Warwickshire E.C.; director of education, Warwick.

ST. HELENS.—School (400 places), Windlehurst, for the Borough E.C.; W. H. Andrew, clerk.

SALFORD.—Church, Langworthy Road, Pendleton (£9,000), for the Welsh Wesleyan trustees.

SCARBOROUGH. — Elementary school, Seamer Road (£16,000); borough surveyor, Town Hall.

SHEFFIELD.—38 houses, Wybourn Estate; R. T. Hinchliffe and Son.

SOUTHPORT.—School, Birkdale (£16,000), for the Borough E.C.; Grayson & Barnish, architects, Liverpool.

STANTON HILL (NOTTS).—Alterations, Stanton Cinema; Cinema Company.

STARCROSS.—Mental colony, Langdon Farm; Devon County Council.

THORNTON HEATH.—84 houses, Carolina Road; J. T. Keen and Sons, 47, Mitcham Lane.

UPTON (YORKS.).—Council school; South Elmsall Education Committee.

WARRINGTON.—Shops on housing estates; borough engineer.

WEST BROMWICH.—Alterations, &c., laundry, Hallam House, for the B.G.; J. P. Osborne & Son, architects, 95, Colmore Row, Birmingham (returnable deposit of £2 2s.).

WEST MALLING.—Central schools, for Kent E.C.; director of education, Sessions House, Maidstone.

WHIPPINGHAM.—Generating station buildings, Kingston, for the Isle of Wight Electric Light & Power Co.

WOKING.—Saw mill and extensions of timber shed, Chertsey Road; Messrs. Spanton. Addition, Skating Rink, Walton Road; A. Pitcher.

WORKSOP.—Alterations, Miners' Welfare Hall; committee.

YORK.—Housing scheme (50), Bad Bargain Lane; F. W. Spurr, city engineer. Improvements, Heworth School (£4,000); managers.